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EDITORIAL NOTES.

The Coal Crisis—Looking for a Way Out.

ALL eyes the end of last week were turned expectantly to the Trade Union Congress which is being held this week at Portsmouth. From the Congress it is hoped something or other acceptable to the country will be forthcoming which will save the community from the disaster of a coal strike. It is quite likely that the upshot will be that the Government and the miners will themselves come together again, and try to discover a means of avoiding the threatened crisis. We feel this will be so notwithstanding the result of the strike ballot, notwithstanding the brotherly view with its inscrutable basis of the other two members of the Triple Alliance that the claims of the Miners' Federation are "reasonable and just" to loot certain millions from the national exchequer which are intended to assist in liquidating part of the nation's terrible debt, and notwithstanding the resolution of the Miners' Federation that notices to quit work shall be handed in by the miners to terminate not later than Sept. 25. No one wants a strike if it can be avoided on really fair grounds; and it is from this point of view that at the moment it is best to consider the position.

There have been very appreciable signs of the leaders of the Miners' Federation relaxing; and they have good cause. In the first place, although the ballot of the miners gave them 606,782 votes in favour of a strike, and a majority of 367,917, there was the significant number of 238,865 votes against taking action, and out of a membership of 904,000 of the Federation 58,353 did not register a vote. Moreover, there are 1,206,000 people employed about the mines; so that those voting in favour only represented about 50·3 p.ct., although the necessary two-thirds majority was secured in respect of those who actually did vote. The leaders, too, know full well that the number voting in favour of a strike included many who did so out of loyalty to them, and not because they felt a strike in the circumstances was justified. The smallness of the majority in favour of a strike in the Yorkshire district also shows that other influences than those the leaders of the Miners' Federation sought to justify dominated the workers in that area. Thus there were in the ballot itself several points for serious reflection on the part of the militant leaders. Then as to the pious endorsement of the National Union of Railwaymen and the Transport Workers' Union as to the justness and reasonableness of the miners' claims. The endorsement was quite anticipated. They could not wholly turn on their allies. But there has been no public avowal by them as to a strike being warranted. They formed a Committee to watch events; but so far they have given no outward or visible sign that they are doing anything more than to take a passive interest in what the miners and other people are doing. Practically all the rest of organized labour see ruin for industry and their Unions if the miners come to a trial of strength with the country. They, too, are hoping for a way out of the difficulty being found at the Trade Union Congress. On top of this, public opinion has gone solidly against the Miners' Federation; and it was public opinion that they set out to win by the pseudo-altruistic sop of claiming a reduction in coal prices for the domestic consumer.

These are the conditions which the Miners' Federation see to-day; and they recognize now that Mr. Smillie made a sad mess of things when he, with undiplomatic and undisguised swagger, announced that the Federation—meaning Mr. Smillie and his faithful henchmen—could not climb down, that the two claims they had made were indivisible, and that the real objective was nationalization. On learning this the country squared its shoulders, and determined not to sell its birthright of liberty to the Miners' Federation at the insulting price offered by them. The attitude of the other trade unions, and the frank statements that have been made by their leaders and by employers as to the rapid closing-down of works all over the country in the event of a coal strike, have caused some of the leaders of the Federation to appreciate much better than they had done before the enormity of bringing about a strike in the effort to force compliance with their claims. They also now appreciate that even a strike has its limits, as have also the funds of the labour organizations; and that it does not by any means follow that a strike will result in what they may set-out to achieve. Moreover, the very source from which they desire to get these claims satisfied would be dried-up by their own action. A more quixotic position the Federation have never occupied. That the leaders of the organization recognize these things has been shown by events. One of the more moderate of the miners' leaders told the public last week that a ballot does not necessarily mean a strike. It is only the authority to take, if need be, a certain line of action. Then we have the fixing of the date for the termination of the notices at Sept. 25, while it was fully anticipated that the day would have been a week earlier. The additional week was no doubt decided upon with the definite object of having more time in hand for bridging-over the difficulty created by excessive demand, and the attempt on the part of the Federation to override the policy of the duly elected Government of the people. But the extra time will no doubt be utilized by the Federation leaders as an evidence of their earnest desire to allow full opportunity for finding a safe path along which to pass so as to escape from the muddle into which their singular policy has placed them. Now they are seeking by Press propaganda to justify their attitude, and to shift to the shoulders of other people blame for certain disagreeable features in the working of the coal industry. Here again they are starting late in the day. Their previous actions have had a hardening influence upon public opinion—in fact, in all they have done the last few years, there has not been that statesmanlike wisdom which should control the actions and policy of an organization admittedly so powerful as the Miners' Federation.

The Government have detected the rifts in the obduracy of the Federation; and they feel the pressure of the desire of the other trade unions that means shall, if possible, be discovered, without delivering the country into the hands of the Federation, for escaping the menaced disaster to home industry and commerce, and the privations that the labour world generally would suffer. Through Sir Robert Horne, the Government have therefore suggested that the question of miners' wages should be submitted to the decision of an impartial tribunal, such as the Industrial Court. This, however, the Federation will not entertain at any price. There is an alternative, that payment shall henceforth be on production; and perhaps this will be found more acceptable to the Federation—if not to their constituents. But the Government will not (and properly so) relinquish the right, and virtually place it in the hands of the Federation, to fix the price of home coal. This price must be on an economic basis. There have been suggestions too from the Federation that the whole subject of the working of the mining industry, particularly with regard to output, should be thoroughly and independently investigated.

Considering all these points together, there is, as we write, ground for some hope. Even, however, before this article is printed—the position changes so rapidly—fresh events may arise which will either diminish or enhance the hope. But though there is at the moment optimism that the threatened worst will not happen, there is no complete assurance or confidence. In the circumstances, until there is assurance, Precaution and Preparation are the best guiding words in the vocabulary of responsible gas men.

Benzole Prices and Production.

THE prices of most commodities not produced by the gas industry or other carbonizers of coal may go up, and comparatively little public notice is taken of the matter. The fact of the increase is accepted philosophically by the public and the newspapers, and as something that is inseparable from these times when new economic conditions have made, and continue to make, rude havoc of pre-existing values. But as soon as an upward change is effected in the price of any one of the products of the gas industry, there is an outcry, backed by a Press which has no more understanding of the position than the general public, though common sense ought to assure the writers that movements in the prices of money, plant, materials, labour, and railway rates cannot proceed without affecting gas-works products among the rest. These are not by any means the favoured subjects of preferential treatment in respect of costs. The price of benzole has gone up 7d. per gallon, and so has the price of petrol. Motor users and the newspapers have been irritated by the increase in the price of benzole, and have made many wild statements concerning it. They seem to hint at some collusion with the petrol interests; and many unkind things have been printed about the National Benzole Association. All the "hints" are wrong; all the "unkind things" are undeserved. By the way, the National Benzole Company, Ltd., must not be confused with the National Benzole Association, which is not a trading organization, but watches over the general interests of all benzole producers, crude and refined.

A writer in the "Times" says: "The action of the benzole "manufacturers seems to call for some explanation." It is not difficult to give the explanation. There has been for some time now a great deal of talk by our friends of the motor world regarding the reduction of benzole production by gas undertakings and coking plants; and there have been strong appeals to the Legislature to make the extraction of benzole from gas obligatory on the part of all gas undertakings. There would have been no decline in the production of benzole by gas undertakings, and the need for compulsion would probably not have arisen even as a suggestion, if extraction had been a paying proposition. And this the Government recognizes; but those who want benzole for motor purposes do not appreciate it, or pretend they do not. It all depends on the position of a gas undertaking whether it pays to recover benzole, wholly or partially. In most cases, the determining factor as to recovery or non-recovery is the price that can be obtained for the crude product. If this price does not pay a gas undertaking, then those responsible for the conduct of the concern would be very foolish indeed to engage in a money-losing venture. Under the old retail price of refined benzole for motor purposes, the National Benzole Company (formed for the purpose of marketing motor benzole, and of which most of the important producers of benzole are members) could not afford to pay the price for crude benzole that other people who want it could do; and yet the members could not put the price of refined benzole above that of petrol—benzole being quantitatively, although not qualitatively, the weaker member in the motor spirit market. Among those who want to get hold of benzole, and would like to drive the National Benzole Company, as well as the Association, out of existence, are the large and powerful oil companies. The Company have lately, we believe, been able to pay only 1s. 6d. a gallon for crude benzole under the sliding-scale; while the price at which some producers have been selling crude elsewhere has been somewhere in the neighbourhood of 2s. 1d. per gallon. With the increase in the price of refined benzole by 7d., the Company we imagine would be able to offer—shall we say?—about 2s. per gallon for the crude material, which is nearer the current market price. Two propositions are incontrovertible: (1) The Company must be in the position to compete in the market for crude benzole; and (2) the price of crude benzole must be such as to make production worth the while of a greater number of gas undertakings, unless the motor world wants to revert once more to complete domination by the oil interests. It may not be generally known outside that not only have many gas undertakings stopped production because it did not pay at the old price, but, for the same reason, some benzole refineries have had to close-down.

The National Benzole Association, besides being pilloried for raising the price of benzole to a rational and therefore a justifiable figure, have been accused of regulating prices. The Association are as helpless in the matter as the man who, without proper knowledge, indicts them. In "The Times" we read: "The explanation of the increased "price of benzole will be awaited with interest; for the "Standing Committee on the Investigation of Prices ap-"pointed by the Board of Trade reported in February that "the price of benzole had been regulated by the National "Benzole Association simply to conform with the price of "petrol, and was not based on the cost of production." A large part of this statement had to be subsequently eaten by the Sub-Committee who were responsible for it, and who knew so much of the matter that they based their calculations on a gallon of crude benzole being the equivalent of a gallon of refined, while as a matter of fact about 1·6 gallons of crude are required to produce a gallon of refined! No wonder that the Government ignored recommendations formulated upon such a fundamental error as this. As to the Association controlling prices of benzole, they do not. There is nothing in their constitution and rules that allows them to do so. We remember well that several important producers at the inception of the organization absolutely declined to have anything to do with it if there was any question of regulating prices. They wanted to sell at any price, and would not countenance any combination that sought to control prices. It is a sufficient answer to the charge to say that these concerns are still members.

A word in conclusion to those gas undertakings who are not producing benzole, or who have partially slackened off in production. It may be that the addition of 7d. per gallon to the price of benzole will induce more concerns to revert to the extraction of crude benzole. While this has not paid some of them in the past, it may do so in the future with the higher return; and so we hope more undertakings will restart operations in this direction. Here is a suggestion. Those who do so should get into the pool of the National Benzole Company, Ltd. There is a temptation to get a penny or so more per gallon temporarily from the oil companies; but the ultimate and lasting advantage lies in supporting the National Benzole Company. The only object of the oil companies in paying more per gallon is to endeavour to remove the Company, as well as the Association, from their path, and secure sole control of the motor spirit market. If they succeeded in this policy, benzole would come very largely under their domination; and its future state would be worse than that of the past.

It will be observed that there has been throughout this article discrimination between the National Benzole Association and the National Benzole Company. As the distinction does not appear clear to some people, perhaps we may emphasize the point with this explanation: The National Benzole Association was formed for the purpose of bringing together all who are concerned in the production of benzole, both crude and refined, in order that combined action might be taken to protect and further the common interests of manufacturers. It is also the aim of the Association to popularize the use of benzole motor spirit, and to ensure a ready market at remunerative prices. An annual output of 22 million gallons is already represented in the Association. The fixing of a definite standard of quality, universally known as the "N.B.A. Specification," was one of the first tasks of the Association, and to this specification all members are required to conform. The problem of creating an effective scheme of distribution does not come directly within the province of the National Benzole Association, since the handling and transport of benzole is a commercial proposition entailing large capital expenditure. But it was due to the energy of members of the Association that the National Benzole Company, Ltd., was formed as a separate organization for the purpose of conducting the marketing and transport of benzole, and affording to the members a reliable market for their output. Any gas undertakings contemplating the extraction of benzole will be readily given full details of the organization by the General Manager at No. 30, Grosvenor Gardens, S.W. While the Association works in entire harmony with the Company, and co-operation in many matters is essential, the Association will always be an independent body working in the interests of the whole benzole industry, and not in the interests of any one section. Membership of the Association entails the payment of an annual subscription: (*a*) For crude producers who are not refiners, 2s. per 1000 gallons annual production of crude; (*b*) for producer-refiners, 4s. per 1000 gallons annual production of refined benzole and its homologues; (*c*) for refiners purchasing the whole or part of their

crude benzole, 2s. per 1000 gallons annual production of refined products from such bought material. For their own production, 4s. per 1000 gallons annual production. The liability of each subscriber is limited to the amount of his subscription, which is payable half-yearly on March 1 and Sept. 1 of each year, based on production for the preceding six months to Dec. 31 and June 30 respectively. This explanation we think will clear up a doubt as to the distinct operations of the two organizations.

Professional Organizations for Technical Work.

RECENT times have brought many changes; and they have wrought changes to the gas industry and gas profession in Scotland as well as to their like in other parts of the United Kingdom. Following the evolution of affairs in the gas industry, there has been a devolution of work from the North British Association of Gas Managers to those organizations that have been established for the express purpose of dealing with matters of policy and commerce. The same thing has occurred in connection with the Institution of Gas Engineers. The fact of the matter is the interests, affairs, and mutations in the circumstances of the gas industry have become too vast and too unwieldy for any one organization, and that a professional one, more especially as there is, without reference, an absence in such bodies of authority for pledging their concerns to any particular line of action. But the change is not a matter to be deplored by the professional organizations. It is a mark of healthy development—the devolution of work being due to the evolution of the industry scientifically, technically, and commercially. This means for professional gas men and their organizations an extended sphere of technical usefulness, and an increased vitality. What has for some thirty-six years been known as the Informal Meeting of Scottish Gas Managers has now been merged in the North British Association; and henceforth the latter body are proposing to hold two meetings in the year. This will compensate for the loss of what had at one time great popularity for its real informality, but which informality has of latter years been largely superseded by something more akin to modern convention. The North British Association will not lack for topics to engage attention at their two meetings. We have only to look at modern developments in construction, processes, and management within the works, in the region of gas utilization, and along the lines of the secondary products, to see that there is an amplitude of technical work for the professional organizations to undertake. Take the Gas Regulation Act, and read it in conjunction with the Board of Fuel Research report, and the two together open up new vistas of profitable development. Never have gas engineers had greater opportunities than they have to-day; and it is for them to concentrate individually, and collectively through their organizations, upon those things that lead to development. Upon them there is a responsibility not only to the present but to the future. So we agree heartily with the view of Mr. R. W. Cowie, as expressed by the concluding words of his Presidential Address to the North British Association last week, that in the changed circumstances the organization should become more influential than ever in the cause of progress.

Capital Expenditure and Modern Plant Efficiency.

Now that the Port Glasgow Town Council have mended their ways, and have taken to the path of enlightened action in dealing with their gas undertaking, we are sure that the members will have no objection to our saying that, during a long career in connection with the gas industry, we have never read a worse story of elaborate neglect of a municipal gas property, and of procrastination in doing what official technical advisers said time after time was the right course to pursue, than Mr. Cowie presented in his Presidential Address to the North British Association. Mr. Dilly and Mr. Dally were both, it is clear, at one time members of the Port Glasgow Town Council. Fortunately they are not so to-day. Their places know them no more. It was fortunate for the inhabitants of the town that they have had gas engineers of resource who were able to meet startling situations due to neglect of advice, or there would have been many a long occasion when they would have suffered the want of a gas supply. At Port Glasgow, the President tells us, in a manner that plainly allows the inference, administration (or rather mal-administration) permitted the works to reach the verge of collapse—in fact, several parts did collapse; and the engineer never knew just where or when the next accident would occur. There seems to have been no proper maintenance, no proper renewal, and no proper provision for safeguarding by storage or by any other means the gas supply to the town. The Town Council have much for which to thank their engineers, whose advice at intervals they have made a show of taking; but beyond acquiring a site for new works, until Mr. Cowie's time (after he had reaped a rich harvest of trouble, which would have caused the collapse of some men) they did nothing. How the responsible officials managed before the war to supply gas at the price they did, and maintain the supply, are matters for surprise.

The state of affairs which existed, and which still exists until the new works are a few months hence brought into use, is described both by words and pictorially by Mr. Cowie. The penalties of procrastination were not only the troubles brought upon the engineers and the jeopardizing of the continuity of the gas supply, but another is found in the fact that, had the new works been proceeded with before the war, their cost would not have been what it is to-day. This fact is as palpable as anything can be. And yet a very striking point can be made out of the figures given in the paper; and we see in this the influence of modern efficiency upon capital costs. Before dealing with this, let us say briefly that the new works are also described in the address; and all but a few items of the works are new—the exceptions being certain pieces of plant that can be transferred from the old works to the new. The central features of the new works are Glover-West vertical retort-settings, with all the ancillary coal and coke plant, and a gasholder by the Barrowfield Company of ½ million cubic feet capacity. The works are complete down to the workshops, offices, and stores, and are so planned as to allow of ready extensions. But as to the point in mind. The productive capacity of the works as they stand is equal to 180 million cubic feet per annum; and their cost is £96,334. We know what costs are to-day; but these figures work out to only £535 per million cubic feet of output, or 10s. 8·4d. per 1000 c.ft. This is not a figure that compares at all badly with even pre-war costs. The total capital expenditure (without including repayments) for the dilapidated inefficient old works, we venture to say, was not before the war below the £535 by more than £85 per million cubic feet of output. Considering costs to-day, Mr. Cowie, with an able coadjutor in higher efficiency, has done remarkably well for Port Glasgow. When he has had experience of his plant, and settled upon the extent of charge steaming (he is utilizing a portion of the heat of the waste gases for superheating the steam), we hope he will add to the interest of his present figures by telling us what the expenditure of £96,334 works out to per therm. This is a new habit gas engineers have to cultivate; but, of course, there cannot be complete accuracy in such a computation until the plant is "tuned-up," and settled conditions with the coal used have been realized. But it will not be long before Mr. Cowie will have to be working on a declared calorific value.

However, despite high costs, it will not do for gas administrations to allow their works to run-down to a state of debility and decay. The responsibility to maintain gas supply increases; it does not diminish. Never has a quinquennium revealed to such an extent as the one just past the potentiality of gas in the life of the community and the nation. Its applications increase; its uses become more extensive. Science, commonsense, and the actual trend of things all point to the economical obtaining of heat as and when required, and whatever the purpose, by labour-saving means becoming the sister predominant public service to water supply. Heat is needed in every home, factory, and works. Power is not. Science has not yet found a more economical way, through a common subterranean distribution system leading into the houses of rich and poor alike, of supplying a heating agent, than by carbonizing coal. The whole of the members of the Triple Alliance may stop work; but so long as the gas men are loyal, and there is a good stock of coal on the gas-works, gaseous fuel can be sent to the homes of the community without other labour. Gas-undertakings are going to take a greater part than ever in the reformation of urban life—domestic and industrial. For this every gas-works must be prepared, and for keeping pace with progress every gas-works must be maintained in its equipment. There must be no more history such as that

which has come from Port-Glasgow, but to which an end has been put by the new works which, it is hoped, will be brought into operation very shortly.

Gas Regulation Act and Gas Officials.

ABOUT three weeks from now, the first applications may be lodged for Orders under the Gas Regulation Act; and many gas officials are anxious to get on with the work of preparation to show what is necessary for the well-being of their individual undertakings, with the particulars to support their submissions. But as yet the rules and regulations governing applications have not been issued by the Board of Trade. It will be a pity if there is any delay, as not a few concerns are desirous of starting their new careers after the December readings of the consumers' meters. However, the Act, its working, and its potentialities should form the subject-matter for a discussion at a meeting of every District Association during the coming winter. The more the officials of gas undertakings get acquainted with it, the opportunities it offers, and the breadth of meaning that it contains, the better for the success of its early working, and the better will be the arrangements for carrying it out both in its spirit and letter. A great responsibility will rest upon gas officials for making a real success of the Act, not only in their own manufacturing and office work, and in obtaining expansion powers, but among the consumers. The clerical department, and the prepayment meter readers and collectors particularly, will have to be educated up to what they will have to do; and there will have to be a good deal of arithmetical work when the declared calorific value and standard or maximum prices per therm are ratified. Tables for the purpose of rendering assistance may be prepared; but unless they are of an exhaustive nature, they will not fit all circumstances. In some cases, it will be found that two tables—one for ordinary and one for prepayment consumers—will (until a change is effected in the declared calorific value) fit an undertaking, except where differential prices obtain in outside districts or for the diverse purposes for which gas is used, when more will be required. However, a great change of this kind cannot be made without close and serious work; and so discussion of points by gas men at their meetings will be very useful.

A paper for raising discussion on the Act was read by Mr. S. B. Langlands at the meeting of the North British Association of Gas Managers last week. The author asked in the forefront of the paper, "Will the Act be a charter of "freedom, will it permit the gas industry to become again "a progressive industry?" and towards the end of the contribution, he remarks: "I think it may be taken that the "Act is an honest attempt to conserve the interests of gas "suppliers and users alike." We believe that is to-day the general opinion. There was at one time a different view. But that was before the Act was framed, and before people had fully grasped the possibilities that exist in the heat-unit basis. In passing, it may be remarked with reference to Mr. Langlands' question that we had not been aware that the industry had ceased to be a progressive one. Progress has never ceased to be an inherent quality; all that has happened has been that outside conditions (together with the cost of labour inside) have stemmed in a deplorable manner the financial results of the industry's trading and capital return. The intentions of the Act are financial rehabilitation, and the institution of means of accelerating progress and service. Mr. Langlands also finds that the Act, "investing as it does the Board of Trade with very ample "powers, should mean the simplification of procedure in "matters over which the Government claim jurisdiction." Not only "claim," but over which the Government has had jurisdiction, and will, through the Board of Trade, still maintain jurisdiction within the limits of the Act. The measure does something more than simplify procedure in obtaining very considerable powers. It will enable the industry to secure, by the same easier route, legislative changes in powers and terms that time and the evolution of conditions show will be an advantage to the industry, and therefore to its consumers. In past years it has been very difficult—in fact, almost a heart-breaking task—to effect statutory changes. Parliament has hitherto been very conservative in its treatment of the industry; there has been a cold insensibility and obdurateness on its part to scientific progress and change in the requirements of the community; and strong reluctance to make departures from precedents. Opposition, too, from non gas-owning local authorities has been of the most obstructive kind. However, now Parliament itself has shown progress in the Act, and has broken off some of the old shackles of procedure, and transferred part of its work to departmental transaction in the case of the gas industry, as it had previously done in the case of the electricity industry.

The paper largely consists of a summary of the provisions of the Act, with some comments. On the question of consumers' accounts, Mr. Langlands puts the question, "Will "you still render the account in cubic feet, putting promi-"nently on the face of the account form the declared calor-"ific value and the minimum permissible pressure, allowing "the consumers to make their own computation as to the "value received in therms of gas?" We do not see the object of the question; and Mr. Langlands himself appears to be rather doubtful as to its having any particular value, as later on he says: "The Act, I am afraid, binds you to "set forth the standard or maximum price per therm; "therefore the total cost of the therms supplied." The Act abolishes (on the issue of an Order) the per 1000 c.ft. basis of doing business; and there will be no price fixed by the Order at per 1000 c.ft. Such a course would be totally destructive of the new scheme. Business is to be on the heat-unit basis, and that alone. So the charge will be by the therm—no matter how many cubic feet are supplied to constitute the therm. To render an account in cubic feet, and put upon the face of the account the declared calorific value and the price per therm, and to allow the consumers to make their own computations, would simply reduce to a farce the new basis. We are hoping for something more than a mere question of account being regarded as the whole design of the new business basis for gas. We are looking to the industry deriving much advantage from the consumers acquiring the habit of thinking in heat units, and realizing that they are purchasing and are paying for heat units, and not cubic feet. Gas men have to examine beneath the surface to see and appreciate what this will mean to the business of the industry in future.

Two or three other points in the paper might be criticized, but are not important. The meter clauses of the Act, it is observed, give satisfaction to Mr. Langlands, as they do to gas men generally. No doubt, too, when the rules and regulations dealing with meters are framed by the Board, it will be found that they will incorporate some, if not all, of the suggestions to which he refers, and which emanated from the conference of representatives of the Association of Statutory Inspectors of Gas-Meters, the Institution of Gas Engineers, and the Society of British Gas Industries. One correction should be made towards the end of the paper. The author says, "There is a striking similarity in the power "which the Board of Trade will under the Act exercise "over gas undertakings to that which they already exercise "over electrical undertakings." The Electricity Commissioners constitute a department of the Ministry of Transport, and not of the Board of Trade. In this we see a distinct advantage for the gas industry, as now it has a department of the Board of Trade that will be able to devote itself very largely and closely to the interests of the gas industry.

False Economy.

THE meeting of the North British Association was fertile in statement as to how not to do things, and confessions as to such things having been done. We have seen something of this in the President's Address; and in the paper by Mr. T. W. Harper we are shown the waste and expense that have come upon the Ayr gas undertaking through the folly of saving initial outlay by the dismemberment of the original scheme of Woodall-Duckham plant by eliminating the provision of a properly proportioned chimney in a correct situation and of coal and coke handling plant. We cannot altogether charge to these reasons the necessity for the reconstruction of the settings after only four years' service. This Mr. Harper frankly acknowledges (he was not the engineer at the time) was due to the bad working of the settings, through insufficient and inefficient labour during the war. After reading the paper, no engineer will have any difficulty in exonerating the Woodall-Duckham system, as a system, and in respect of design and structure, from actual participation in supplying the elements for the sorry tale that Mr. Harper had to tell. A system may be of a type that has never been exceeded in its qualifications for work; but if it is ill-treated—not necessarily wilfully, but through force of circumstances—and is not equipped with

auxiliaries to good and uniform operation, it cannot give of its best in results. The saving that was effected in the original outlay at Ayr, we venture to say, has been completely wiped-out by the indifferent working there has been in consequence of it. The reconstruction of the settings necessitated by war-time incapacity in respect of labour is one thing; but the faulty heating of the settings through trying to economize by coupling them up to an ill-adapted chimney attached to the horizontal settings and boiler is another matter, and costly labour has been involved through the removal from the scheme of the coal and coke handling plant.

It is useful to have the paper by Mr. Harper, if only for the lesson it contains as to the folly, when installing vertical retort plant, of not carrying-out the work with the thoroughness that means ultimate and genuine economy. Another piece of caution is that particular attention should be paid in making an installation to the size of the retorts being in proportion to the make, particularly in circumstances of demand such as exist at Ayr. The retorts there have a daily throughput of 5 tons; while 3 tons would be ample. As it is, it is not unusual to have to put a retort on and let it down twice in seven days. The results of this are a shorter retort-life through the rapid variations in temperature to which the retort material is subjected, and a higher consumption of fuel, than would otherwise have been the case if the retorts had been of more suitable size, and the plant had been complete with its own suitably proportioned chimney. Cold chimneys and poor draught through excessive chimney area for the work is not conducive to high retort temperatures, such as are wanted in vertical settings with steaming. Mr. Harper makes the suggestion as to whether it would not be advisable to consider mechanically induced draught for retort-bench chimneys. The point is worth consideration, if only that it would eliminate large chimneys, would give opportunity for better temperature control, and would abolish the need for high-temperature chimneys to promote draught. Through the conditions under which he is now working, Mr. Harper, even with the improvements that have been made in the bench by reconstruction, cannot show the remarkably high productive results that some of his contemporaries are able to do. But this may be partly due to the coal he uses. At the same time, in the circumstances of the working, he is doing well. He mentions a make of gas per ton of 16,389 c.ft. of 430 B.Th.U. gas, which is equal to 7,047,270 B.Th.U. (or 70·47 therms) per ton. This 430 B.Th.U. we take to be net; for looking at the analysis, the gross calorific value is given there as 478, which makes a considerable difference for the better—the make at this figure being 7,833,942 B.Th.U. (or 78·33 therms) per ton. The paper by Mr. Harper will be of considerable service to other engineers, as it will cause them scrupulously to avoid the conditions from which the Ayr undertaking and he have been and are suffering.

Applications for Orders.

Directors, committeemen, and chief officials of gas undertakings contemplating making early applications to the Board of Trade for Orders under the Gas Regulation Act will remember the suggestion of the Central Executive Board of the National Gas Council of May last that, with a view to avoiding congestion, each district of the Council should put up two representative cases to be dealt with in the first instance. The object of this is obvious. We presume the suggestion will again come before the Central Executive Board at their next meeting; and, if so, it is quite probable that it will be confirmed. The Board of Trade, we should fancy, would prefer a little methodical procedure at the initial stages of their work. It is understood that they have well in hand the rules and regulations which it is proposed to issue with reference to the making of applications.

Zoning and Grading Gas Undertakings.

Not much time has been lost after the Oxford Conference of the National Federation of General Workers in getting to work upon the completion of the zoning and grading of gas undertakings. The Executive Committee of the Joint Industrial Council for the Gas Industry were sitting last Thursday, and put the finishing touch to the draft of a scheme. Now the Regional Councils are going to have their turn at the scheme, and then the Executive Committee will again meet. We hope the scheme in respect of grading will deal not only with gas undertakings but with men, for degrees of skill and responsibility have as much right to recognition as degrees in the output magnitude of gas undertakings.

The Sliding-Scale and the Minimum Dividend.

In a statement issued by the Chairman of the South Metropolitan Gas Company (Dr. Charles Carpenter) to the proprietors, who will only meet annually now, he has not a good word to say for the sliding-scale under present-day conditions; and there is much sympathy on our part (as readers of the "JOURNAL" are well aware) with his views on this subject. He calls the sliding-scale "unjust" and "antiquated." The need for it "ceased long ago;" and it has "wrought a great and cruel injustice upon gas shareholders during the war." Notwithstanding, the sliding-scale rendered good service to the industry at one time of day; and this service must be remembered with gratitude. But the war and heavily fluctuating conditions (with the competitive circumstances of business nowadays) have made it necessary to give to gas share and stock holders some more reliable protection than was afforded by the sliding-scale. Dr. Carpenter tells the stockholders of the South Metropolitan Company that they have lost half-a-million sterling during the war through the operation of the sliding-scale. This is not a pleasant reminder. But, as a matter of fact, they have lost more than that. They have lost the use of the money; and the interest it might have been progressively earning if it could have been spared for investment. The Company's Act has superseded the sliding-scale by a new scheme, which, "under all circumstances," will give the stockholders 5 p.ct. per annum in respect of the issued capital, and 6 p.ct. in respect of the unissued ordinary stock; and these dividends the stockholders will "henceforth" be able to divide. This looks hopeful for next half year—whether in respect of the current half year is not stated. Beyond this assurance of a better dividend, profits earned over and above these rates of dividend will be divisible as to three-fourths by way of reduction in price per therm to the consumers, and one-fourth in equal parts to the stockholders and co-partner employees. The encouragement and security that this will give are certain. Again we commend to the consideration of gas administrators this new system. Up to now we have not seen a single adverse comment upon it.

Releasing More Coke-Oven Gas for Town Purposes.

In considering, at the recent meeting of the Society of Chemical Industry, the question of the utilization of coke-oven gas for town distribution, there was advocacy of the use of producer gas for heating the ovens, in order to release a larger proportion, or the whole, of the coke-oven gas for sale to gas authorities. An interesting contribution to this subject has been made in a paper read by Messrs. J. Becker and F. W. Sperr, before the Blast-Furnace and Coke-Oven Association of Chicago. The paper deals mainly with the Koppers triangular flued oven, which has been developed into a combination oven, capable of being heated either by producer gas or coke-oven gas. Forty of these ovens have been in use during the past year at the works of the Providence Gas Company, Rhode Island. Part or all of the ovens may be operated with producer gas as the demand varies for domestic gas and for coke. For a gas-works this makes an arrangement of ideal flexibility. The authors point to several advantages of producer gas firing. Owing to the absence of hydrocarbons, there is no accumulation of carbon in the gas-distributing system. Practically no attention need be given to gas pipes and flues. Flue temperatures are easily adjusted and remarkably uniform. There is less possibility of localized overheating. Producer gas, being handled in relatively larger volumes than coke-oven gas, no such fine adjustments are necessary with the former as with the latter. Slight irregularities in the rate of gas-flow, in the way of adjustment, or in the height of flame, make much less difference in the coke temperature than would result from similar irregularities in the case of coke-oven gas. With producer gas, it is a simpler matter to maintain efficient and uniform heating with a low percentage of excess air than when using coke-oven gas. At Providence, the analysis of the products of combustion showed 17 to 18 p.ct. carbon dioxide with about 1 p.ct. of oxygen and practically no carbon monoxide. Such a close approximation to theoretically perfect conditions of combustion is a very notable achievement. At fourteen hours coking time, the temperature of the stack gases is about 350° C. The

amount of coke (other fuels may, of course, be used) required for the producers is from 12 to 14 p.ct. of the weight of the coal charged into the ovens, which amount may be readily obtained by screening the oven product, leaving a thoroughly clean coke for blast-furnace use.

PERSONAL.

Mr. GUY S. DAVIES has resigned the position of Engineer and Manager of the Risca (Mon.) Gas-Works.

The Secretary for Mines, with the approval of the President of the Board of Trade, has appointed Mr. E. A. GOWERS, C.B., to be Permanent Under-Secretary for Mines.

Mr. T. H. HARVEY, of the Birmingham Corporation Gas Department, has received the O.B.E. for special services as a chemist rendered during his term of active service. On returning to Birmingham, he resumed his work at the Central Laboratory, but has recently joined the engineering staff, and is at present engaged on the coke-ovens and Mond plant at Saltley.

After more than forty years' service, Mr. W. E. VINSON has retired from the position of Secretary of the Gloucester Gas Company, and has been elected to a seat on the Board. Reference to his connection with the Company will be found in the report of the proceedings at the half-yearly meeting which appears on another page. Mr. Vinson's successor as Secretary is Mr. T. B. JAMES.

Natural Gas Statistics.

An abstract of figures relating to natural gas supplies, which are being compiled for them by the United States Geological Survey, covering the year 1918, has been published in the "Gas Age." It appears that the production of natural gas in the United States reached its peak in 1917; the volume of commercial natural gas produced in 1918 being 9 p.ct. less than in that year. The total production in 1918 was 721,000 million c.ft.—a decrease on the preceding year of 74,109 c.ft. Along with this decrease in output, however, the market value, at $153,553,560 exhibited a gain of $11,464,226, or 7 p.ct. The average price per 1000 c.ft. in 1918, at the point of consumption, based on the total production and total market value, was 21·29 c.—a gain of 3·42 c., or 16 p.ct. There were at the close of that year 40,369 wells producing natural gas; and the total acreage of natural gas lands, including reserve, was 14,578,056 acres, which was 866,093 acres less than at the end of 1917. An outstanding feature of the year's operations was an increased use of the gas for domestic purposes, and a decreased industrial consumption. This is precisely the end aimed at by the conservation movement. One of the factors which has brought about an increased supply for domestic use is the restriction for this purpose by some Public Service Commissions of industrial sales between November and May. During the summer, when the demand for domestic gas falls off, more is again sold to industrial establishments. In 1918, 2,508,543 domestic consumers utilized 271,102 million c.ft. of gas, or 38 p.ct. of the total volume consumed. The average price per 1000 c.ft. of domestic gas was 31·35 c.

A Big Coke-Oven Gas Contract.

In connection with the works of the Ford Motor Company at River Rouge (Mich.), there is an installation which, Mr. S. R. Bellamy recently told the American Institute of Chemical Engineers, is considered by many to be the finest bye-product coke-oven plant in the world. It has been in operation for nearly twelve months now, and its chief function is to supply a high-grade metallurgical coke to the blast furnaces. At the same time, however, a contract with the Detroit City Gas Company calls for 10 million cubic feet of 18 c.p. and 600 B.Th.U. gas per day. The ovens must maintain the highest quality in both products. The plant consists of 120 standard Semet-Solvay regenerator coke-ovens, built in two batteries of equal size, but each battery independent of the other in the matter of control. The gas direct from the ovens is received by a double hydraulic main—one main taking the rich gas given off during the first period of carbonization, while the second main receives the remaining lean gas. The rich and lean gas are treated exactly alike up to the benzol scrubbers. Here the treatment is different; and after passing through the scrubbers, the lean gas returns to the ovens, and the rich gas (following enrichment and purification) goes to the city. The apparatus and equipment used to handle the gas is built in triplicate—one unit for the rich gas, one for the lean, and the third and middle unit (connected so that it can be used for either rich or lean gas) as a spare. Thus repairs, cleaning, and inspection do not result in inefficient or irregular operation. In fact, the plant is operated on a time-table schedule, which is essential to the production of a satisfactory quality of surplus gas, where high standards are required. The initial rich gas has been produced without an appreciable variation in B.Th.U. value for more than three months. Operating on an 18-hour schedule, the plant has a daily capacity of 2400 tons of coal. Each oven is designed for a charge of 15 tons of pulverized coal, and to carbonize this coal in any period from 16 to 30 hours, as desired.

ELECTRICITY SUPPLY MEMORANDA.

THE Electricity Commissioners have provided a testimonial to their activity; and there is little doubt that events will prove their efficiency. The testimonial comes in the shape of a report which has been issued by the Ministry of Transport on the first five months' work. The wonder is that the Commissioners were able to get through such a large amount of business since they seriously began it. They have, at any rate, not been idle. To summarize some of their doings: Seven electricity supply districts have already been defined; but no scheme for a Joint Electricity Authority has been approved. In the matter of power stations, reference is made to the competing schemes of the Nottingham Corporation and the Derbyshire and Nottinghamshire Electric Power Company. The Commissioners are not satisfied that two large stations are necessary for the neighbourhood; but they have not yet indicated which they consider merits their favour. This shows that the Commissioners intend that their judgment shall have a good technical basis, and that an area shall have what, in their opinion, is the most economical source of supply. The Commissioners have been busy (no pre-existing Government Department could have got through the work in the time) in investigating and sanctioning applications for loans for new generating stations and extensions to existing ones. The total of the loans authorized is £2,127,236; and this refers to only part of the 227 applications received for borrowing powers. One thing that has weighed with the Commissioners has been the need for facilitating the extension of electricity in the district concerned, without waiting for the supplies promised by the big power stations. They have kept in sight, too, in considering the technical details, the ultimate development of the electricity supply in the area; and they refuse to allow the extension of a badly situated station when a better placed one in another district can be extended, and so render assistance to the other. These are good principles. It is a policy of sound evolution, and not of unwise sudden revolution, that is being pursued. The Commissioners are also allowing supplies to be made outside the areas of undertakings to specified premises where expediency ratifies. There are increasing consents to the use of overhead wires in rural areas. The maximum charges of several undertakings have been raised; and the Commissioners have authorized subscriptions (where permission is sought) to the Incorporated Municipal Electrical Association, the British Engineering Standards Association, and the Electrical Development Association. The electricity industry is reminded that it cannot have Commissioners of its own without being put to some cost in connection with them and their work. Although the Treasury are for the time being finding the cash with which to meet current outgoings, the industry has to refund the money within a measurable time; and then a levy will thereafter be made to keep things going normally. The value of having experts at the head of legislative work is being proved.

Activities of the Commissioners.

Loans and Repayments.

The Commissioners have been considering, among a thousand-and-one other matters, the periods for the repayment of loans. The result is that in some directions there is greater latitude; in others, a tightening-up. The Commissioners have the technical knowledge which tells them where long life will be, and where short life may be expected, with such confidence that it might almost be guaranteed. It is thought that the following periods are very favourable: Mains and services, 25 years; buildings. 30 years; plant, including rotary converters and transformers, 20 years; high-tension trunk cables, 40 years; sub-station sites, 60 years; and overhead lines, 25 years. One critic who believes he knows better than the Commissioners considers the last three items have been too generously treated. Perhaps they have been. On the other hand, he is of opinion that the period of seven years allowed for apparatus, fittings, and appliances to be let on hire is rather too short, and so is a decade for the repayment of loans for Diesel engines. The period of ten years is also allowed for meters, fittings, and furniture. The critic thinks these are goods that it would be better to pay for from current revenue. Doubtless there will be revision by the Commissioners as they gain more knowledge as to what constitutes a good average life under the new conditions, although life frequently varies under local influences.

The Minimum Charge.

It will be remembered that there was quite a furore in the papers when Government Departments were exhorting electricity consumers to economize in their consumption of current, and when those who loyally obeyed found themselves faced with a minimum charge covering units which they had not consumed in a quarter. Naturally the consumers did not like the penalty. Since then the Board of Trade, when granting an increase in the statutory price (the "Electrical Review" tells us), have been taking the opportunity of cancelling the minimum charge. But small electricity concerns did not approve of this; and, upon their appeal, the Electricity Commissioners are again inserting a minimum charge in the Orders they issue. A change, however, has been made. Previously the minimum charge was 20 units

per quarter for all quarters alike. This, our contemporary states, is now being changed to 15 units for the winter quarters, and 10 units for the summer quarters. This is an alteration which is of advantage to the consumers; but the 15 and the 10 units have to be multiplied to-day by prices per unit double, and more than double in some cases, the former prices for energy. The statutory charges have of late risen to 1s. and 1s. 2d. per unit in many instances; while 8d., 9d., and 10d. may be regarded as quite common prices.

Pressing for Government Support.

Municipal authorities who do not desire the compulsory purchase and joint board clauses of the 1920 Electricity Supply Bill (which has found a resting-place at Westminster) are, as we recently intimated, very desirous of securing preferential financial support from the Government. A new move to this end is for resolutions of a similar character to be passed by municipal authorities all over the country. These resolutions express the view that no progress can be made by the Joint Electricity Authorities formed under the Electricity (Supply) Act, 1919, unless satisfactory financial arrangements are incorporated in the scheme or the Order confirming the scheme. Therefore, it is considered of paramount importance that the financial clauses (Nos. 12 to 15) of the shelved Bill shall be passed into law at the earliest possible moment. This is a nice little bit of artifice. There is no more difficulty in financing joint authority schemes than for local authorities to finance their individual concerns. If they had not joint generating schemes, they would have to enlarge or build new stations of their own. A second resolution puts on record the opinion of the authority passing it that, in connection with any schemes under the Act of last year, and any amending Acts, the ownership of the various works and the control of the generation and main transmission of electricity should, as a general principle, be placed in the hands of duly elected public representatives of the district in which the electricity generated and transmitted is to be used. This, of course, is the expression of a desire to shut-out private enterprise from all participation in the joint schemes, other than as purchasers of current from the joint authority. In other words, it appears to be desired that they should have no voice whatever in the control of the generating scheme.

Hiring Powers for Local Authorities.

It is safe to predict that most electricity supply undertakings that have not already hiring powers will make application under section 23 of the Electricity (Supply) Act of last session for authority to bring such powers into effective use. Some have already done so, and are asking for loans for rental wiring and fittings. The Basingstoke Town Council are one of the authorities who have obtained powers in this direction; and they are proposing to supply consumers under a rental wiring scheme on a contract method of charging. These are the lines which are to be followed in connection with the dwellings being erected under the local housing scheme. Maidstone has also secured borrowing powers for fittings and apparatus to be let on hire. No objection can be raised to this, so long as proper accounts are being kept, and the business is made self-supporting. The time is regarded as favourable for this work, as it eases the terms on which householders and others can have electric installations. Municipal electricity undertakings have been debarred from selling outright to consumers. The electrical trade looked to this; and municipal undertakings do not bless them for it. But the hiring system puts a new commercial implement into their hands. The only trouble we see is that in connection with rental wiring, householders who are only rental tenants of their houses may not be willing to bind themselves for a number of years; and a new incoming tenant may not be disposed to be saddled with the rental for the wiring. What will happen in such circumstances?

"Coal-Saving Hints."

The threatened coal strike brought out the counsellors who never miss an opportunity of advising the public to do things the wrong way. The correspondence columns of the more popular papers have been alive with the emanations of these blind leaders. An example is a letter, signed by "Reg. A. Cobb" [not the Professor of that name], in the "Daily Mail." It was headed "Coal-Saving Hints." There was not a word in it about the gas-fire, which can be lighted-up and extinguished just when wanted. The same thing can happen with the electric-radiator. But the waste of the heat energy of the original coal is so enormous in generating electricity as to put the electric radiator entirely out of court as a saver of fuel in times of stress for coal, or, in fact, at any time. More heat is wasted at the electricity generating station than the coal fire itself wastes. But nevertheless Mr. Cobb seriously tells the readers of the "Daily Mail," and the Editor gives his statement publicity in his columns, that "the best substitute to-day is *in all probability* the electric radiator, as it gives full heat within a minute of switching on, and it ceases to consume energy the instant it is switched-off." "In all probability" clearly implies a doubt, and supplies a line of defence in the event of attack. Mr. Cobb believes in pigmy radiators, of small consumption, and used for a short time. His prescription would, if recommended by an electrical man, bring upon him heaps of derision after experience has proved insufficiency. "A small electric fire, used for about half an hour, will use about half a unit." Of what use would such a radiator, such a consumption, and such a period of heating be in any ordinary sized room? An hourly consumption of 1½ to 2½ watts per cubic foot of room capacity is usually called for, according to the structural conditions of the room, and the prevailing outside temperature. At 2 watts per hour per cubic foot, Mr. Cobb's room should not have a capacity exceeding 500 c.ft.! To produce the ½ unit of electricity for consumption per half hour, Mr. Cobb tells his readers that 1 or 2 lbs. of *low quality* fuel are consumed at the generating station. What does he mean by "low quality" fuel? We ask this because there is no station in the country, unless in a neighbourhood with an exceptionally fine industrial load, that will, using "low-quality" coal, produce a unit of electricity on a fuel consumption of 2 lbs. And what is more, electrical engineers are not partial to low-quality coal. Low-quality coal means loss of boiler efficiency; and considerable labour in attending to the furnaces, and in removing the ashes and clinker, and disposing of them. It is a fine fabrication to say, as Mr. Cobb does, that 1 ton of low-quality coal at the generating station is equal approximately to 7 tons of high-quality coal in the house. Taking a consumption of 4 lbs. of coal per unit, a ton of coal would produce 560 units of current, with a potential heating value of 1,915,200 B.Th.U. If the coal had a heating value of about 13,000 B.Th.U. per lb., this would be roundly 29,000,000 B.Th.U. per ton. An ordinary coal grate will give an efficiency of 20 to 24 p.ct.; so that at the lower percentage the householder would get in heat from his ton of coal 5,800,000 B.Th.U., as compared with 1,915,200 B.Th.U. from the ton of coal delivering its heat as electricity, assuming the electric radiator has an efficiency of 100 p.ct., which it has not. Hence the absurdity of asserting that 1 ton of low-quality coal at the generating station is equal approximately to 7 tons of high-quality coal in the house. Put another way, assuming 4 lbs. of coal has a potential heating value of 52,000 B.Th.U., 20 p.ct. efficiency in the fire-grate would give the householder 10,400 B.Th.U. in useful heat. The 4 lbs. used to produce a unit of electricity would give 3420 B.Th.U.! The 3420 B.Th.U. (allowing electricity 100 p.ct. efficiency) would cost to-day 2d., 2½d., or 3d., and more—8d., 10d., or 1s.—if connected up to the lighting circuit; while the 10,400 B.Th.U. (three times the amount of heat) using the coal direct would cost 1d., calculating the 4 lbs. of coal at 50s. per ton, or at 60s. 1·3d. There is a margin here for lighting-up and letting-down the fire. We are wondering where Mr. Cobb got his foolish information from. Was it from one of the Electric Power Committees' reports?

Position of Private Generating Plants.

The gas industry is interested in private electricity generating stations. Gas undertakings have them upon their own works; and they are concerned in the introduction of such plants into the works of other manufacturers. The Federation of British Industries has recently been inquiring through the Electricity Commissioners into the position of private generating stations under the Electricity (Supply) Act, 1919. As a result, it is learned that under the Act there is no restriction on the establishment of private plant, provided that the owner complies with any regulations made by the Commissioners as to the type of current, frequency, and pressure to be used. Any regulations will be made with a view to ensuring that the type of current, frequency, and pressure will, as far as possible, co-ordinate with those of the public supply in the district. This is in the interests of the manufacturers and of standardization. When standard regulations have been made for a district, a manufacturer putting down a plant which complies with the regulations is not bound to notify the Commissioners; but it is strongly recommended that information should be given. If a manufacturer wishes to put down plant of a type, frequency, and pressure of current not in accordance with the regulations, formal application must be made to the Commissioners for special regulations; but it should be noted that "such regulations shall be so framed as not to interfere with the economical and efficient working of the business for which the supply is generated." Until such regulations have been formulated in any area, there is no legal obligation to notify the Commissioners as to the erection of any private generating station; but here again it is recommended that they should be notified, as the information will be helpful in framing regulations so that they will be acceptable to manufacturers. The Commissioners are confining their attention mainly to public utility undertakings; but nevertheless it is felt that they can be of assistance to manufacturers on most matters connected with electric power supply.

Industrial Alcohol.—Discussing the possibility of furnishing industrial alcohol in large quantities on a commercial basis, Captain Desborough, in a paper presented to the British Association, said it had lately been suggested that considerable supplies of ethyl alcohol may be produced from the ethylene present in coke-oven gases. No information was available as to the manufacturing costs of this alcohol; but in estimates from the Skinningrove Iron Company, the value of it was put at 2s. a gallon. All other methods for the manufacture of ethyl alcohol were based on the conversion of carbohydrates by fermentation. To sum up the position, it appeared to him that, though it was perfectly certain that the total demand for power alcohol could never be met solely by home production, it was too early to say that home manufacture is uneconomical.

CARBONIZATION IN 1900.

By THOMAS SETTLE.

RECENTLY I had occasion to look through notes and records of some 35 years study and research on the subject of carbonization, as a preliminary to the preparation of a paper to be read at the meeting of the North of England Gas Managers' Association in Newcastle on May 1 last. A breakdown in health rendered it impossible to complete the work, or to be at the meeting. Subsequently, the suggestion was made that the paper should be completed, and published in the columns of the "JOURNAL."

The full title of the proposed paper was, "Carbonization in 1900 and in 1920." The first part is included in the following remarks, and the second will be treated in a later article.

The retort-house end of the gas-works has always been my favourite location; and long before my conception of the practical application of the vertical retort—now over twenty years ago—I had fully investigated the reactions concerned in the distillation of coal in horizontal retorts. About 1898, I proved that steam could be used with advantage—as now practised, I am told, in more than 200 gas-works—but being saddled with an 18-candle standard, found it could not be used unless accompanied with enrichment. The Great European War has freed the industry from the shackles in which it was bound, presumably in the interests of consumers. But, as a matter of fact, the losses to users, both in an unnecessarily high price and imperfect combustion, greatly exceed that incurred by the manufacturers. One wonders what the effect on the position would have been to-day if the liberty now allowed, because unavoidable under current conditions, had been freely granted in 1900. Immediately after the introduction of the incandescent burner, it was evident that 16 and 18 candle gas was not conducive either to efficiency or economy. But parliamentary inertia stood in the way.

So long as the material used for constructing retorts was limited to cast iron, the working temperature could not be higher than sufficed for a very moderate yield of gas; and notwithstanding the retention of large quantities of valuable hydrocarbons by the tar—due to insufficient or badly arranged condensation—the illuminating power was, if anything, too high. Complaints of soot or smoke, popularly supposed to be caused by the inferior quality of the gas, were common. The introduction of fire-clay retorts, followed later by gaseous firing and silica bricks, led to the other extreme. There was a period of over-carbonization, due to a feverish race among gas engineers for the largest make per ton. One serious disadvantage was trouble from naphthalene deposits at any point between the gasholder inlets and the burners on the premises of consumers. Frequent steaming of the holder connections and leading mains from the works was not uncommon; while quite an army of fitters was employed in attending to stoppages on smaller mains, services, and interior fittings. In the retort-house there was continual trouble from pitchy deposits in ascension and bridge pipes and the hydraulic main. So far did the craze for high makes extend that these serious troubles were accepted as unavoidable, if not regarded with complacency as evidence of good working.

I agreed with this so far as a good yield of gas was concerned, but not with the acceptance of pitch and naphthalene trouble as a matter of course. So far from being satisfied with palliative courses for cleansing, I wanted to get back to the fountain head, and prevent the formation of pitch and naphthalene in the first place. In the course of investigation into the material to be dealt with in the retort-house, I collected statistics relating to the composition of over a hundred gas coals in actual use in gas-works. The average content on an ash-free basis was:

C	84·75 per cent.
H	5·25 ,,
O	7·40 ,,
N	1·50 ,,
S	1·10 ,,

The organic sulphur compounds varied not only with the quality of the coal, whether pyrites was or was not picked out, &c., but also with the temperature of distillation, weight of charge, retort area, duration of charge, and other conditions.

Volatile matter	32·5 per cent.
Residue in retort	57·5 ,,
Moisture, &c.	5·6 ,,
Ash	4·4 ,,

One would like to compare these figures with those obtained from fair average samples of coal supplied to gas-works to-day, and also the cost on an ash-free basis. The average weight per cubic foot, based on several hundred weighings of through and through and breaker coal, was 52 lbs., nuts 47 lbs., equivalent to 43·08 and 47·66 c.ft. bulk per ton respectively. Some later observations, extending over the last 25 years, showed that the average weight of coke, when contained in an intermittent vertical retort, was 37 lbs. per cubic foot. Fair samples from the yard store heap, 27 lbs.; breeze, 43 lbs.

There is some relation between oxygen content, volatile matter, and moisture. Prof. Lewes says, in his work on "Carbonization of Coal" (p. 179), the higher the oxygen content (1) the higher the proportion of volatile matter, (2) the lower the yield of coke, (3) the greater the proportion of carbon oxides; also that coal containing more than 10 p.ct. or less than 4 p.ct. is non-coking or produces a bad quality coke.

The usual working yields in the year 1900 ranged from 10,000 to 11,000 c.ft. of gas per ton of coal carbonized.

Hunt's "Chemical Technology," p. 117—

Per ton of coal: Gas, 10,390 c.ft.; illuminating power, 15·85 candles (No. 1 burner), 18·3 candles (No. 2 burner); coke, 15·24 lbs.; tar, 13 gallons.

Lewes's "Carbonization of Coal," p. 177—

Gas, 11,490 c.ft.; calorific value, 604 B.Th.U. gross, 543 net.

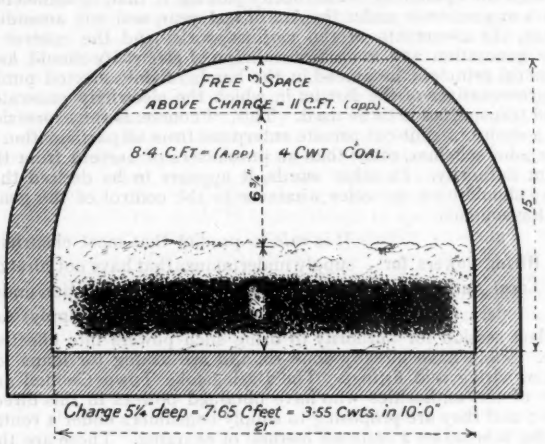
Average weight of products from five classes of coal:

Gas	15·7 per cent.
Coke	64·2 ,,
Breeze	7·8 ,,
Tar	5·2 ,,
Liquor	7·1 ,,

The average composition of the gas supplied from the gas-works at Exeter over some years previous to 1904, was:

CO_2	2·6 per cent.
CO	8·0 ,,
$H \times C \times$	5·1 ,,
CH_4	33·3 ,,
H_2	47·3 ,,
O_2	1·0 ,,
N_2	2·7 ,,

The usual practice (in 1900) is represented by the attached section of a 21 in. by 15 in. Ω retort containing a charge of 3½ cwt. Filled to within 3 in. of the crown, it is capable of containing



7½ cwt. of coal. With the smaller quantity, a depth of 5¼ in. is occupied by the coal; and out of a total cubical capacity of about 20 c.ft., only 7½ ft. are occupied—leaving 12½ ft. clear.

The average weight of each constituent from British gas coals was:

Gas	16·7 per cent.
Coke	65·5 ,,
Tar	7·2 ,,
Liquor	10·6 ,,

In the course of some extensive experiments as to the quality of gas produced at different periods of the charge, I found that the production during the first 10 to 50 minutes was fairly regular at 23 to 24 candles from almost any decent description of coal; but after that it gradually decreased, till, during the fifth and sixth hours, there was no illuminating power worth the name. Yet samples of gas drawn from the black core of incompletely coked coal showed but slight reduction on the original quality. A sample taken during the third hour was 20 candles, though one taken at the same time from the ascension pipe showed only 14 candles.

I have taken a number of tests on twelve different qualities of coal, and found that the average gross calorific value of gas evolved during the first hour was 779 B.Th.U., but that obtained during the fourth hour was only 580 B.Th.U., which shows that the substitution of calorific for photometrical value does not minimize the practical importance of the depreciation in quality towards the end of the charge. The serious loss of both photometric and calorific value may be due to decomposition caused by contact with incandescent coke on the way from the point of generation to the mouthpiece, or exposure to radiant heat while traversing the clear space above the charge, or contact with finely-divided solid carbon carried forward by the current of gas. Of these, the first-named is the most important.

A solid block of coal, exactly 1 c.ft., would weigh 80 lbs.; and therefore 1 c.ft., as it lies in the retort, would contain $\frac{80 - 52}{80}$ = 35 p.ct. of air-space, obviously very irregularly distributed. Nut coal would contain 41 p.ct., and that more evenly distributed. The depreciations in values are much less in nut than in through coal, from which it would seem that contact and friction with the hot coke are largely responsible for the depreciation, though the other causes named are not unimportant.

As a means of getting further information, several tests were made by passing gases of varying quality through tubes heated to

carbonizing temperatures and packed with coke. The rate of travel was adjusted to agree with that obtaining during the fourth hour under ordinary working conditions in a horizontal retort. The results were as follows:

Quality of Gas at Tube Inlet.	Quality of Gas at Tube Outlet.	Loss, B.Th.U.	Loss, P.Ct.
A. 532 B.Th.U.	370 B.Th.U.	162	30·47
B. 620 ,,	465 ,,	155	25 00

Carbon deposited in or on the coke increases its weight, improves the quality, and sells at the current price. Retort carbon fetches a high price; but the effect on the retort-house fuel account of its gradual accumulation, the loss of productive capacity, and incidental labour while standing-off for cleaning, together with the prejudicial effect on the working life of the retorts, more than outsets the price received. As much may be said of the heavy pitch and free carbon in the tar, which are really residues from decomposed gaseous hydrocarbons that should be conserved and sold at the price of gas, or, under the new regulations, according to their calorific value.

Prof. Lewes was strongly impressed with the uneconomic character of excessive secondary decomposition in the retort. [See "Carbonization of Coal," p. 279.] By conserving the hydrocarbons, it is possible to get a gas richer in both photometric and calorific value; and where a fixed quality is desired, such gas will stand a large percentage of blue gas or other suitable diluent.

PRODUCTION OF MONAZITE.

THERE has been issued by the Imperial Mineral Resources Bureau, through H.M. Stationery Office, at the price of 6d. net, a digest of statistical and technical information relative to the production and consumption of monazite during the war period, which is intended to constitute a part of the annual volume on the mineral resources of the British Empire and foreign countries.

The commercial value of monazite is due chiefly to the presence of a variable amount of thoria, the oxide of thorium, which is extracted from it by chemical treatment, and marketed in the form of thorium nitrate, for use in the manufacture of gas-mantles. The amount of thoria in monazite varies. Concentrates should contain not less than 4 or 5 p.ct. of thoria; and much sand exported from Brazil does not contain more than this amount. In the best Brazilian concentrates there is about 6 p.ct of thoria; while those of Travancore and Ceylon contain about 9 p.ct. Consequent upon the shortage caused by the cessation of German supplies, other countries have taken up the manufacture of thorium nitrate; and the United States, it is said, appears to have been specially successful in increasing its production, while British manufacturers have not until recently succeeded so well. For the last year or two, however, it has not been necessary to import thorium nitrate into the United Kingdom. Large residues of cerium compounds are obtained as bye-products; and monazite is also the chief source of mesothorium—which closely resembles radium in its properties.

From a table of the production of monazite in different countries, it is seen that, while in 1913 the figures for India were 1235 tons and Brazil 1415 tons, in 1918 India reached 2117 tons, and Brazil had fallen to 491 tons—Ceylon appearing for the first time with 20 tons. The total production for the latter year was thus 2628 tons. The actual disparity in thoria production between the two countries is much more pronounced than the figures indicate, owing to the fact that the Travancore monazite is much richer in thoria than the Brazilian. The value of the imports of monazite sand into the United Kingdom, which was £22,545 in 1914, was no more than £9365 in 1919. There is an account given of the different deposits of monazite; and it is remarked that those at Travancore, India, are extensive, and will suffice to meet the world's requirements for many years. The total production at Travancore from 1911 to 1918 inclusive amounted to 10,845 tons, valued at £335,146. Substantial deposits of monazite sand have been found in Ceylon during recent years, the quality, as already remarked, being rich; but the discoveries made in the United States have up to now yielded poor results.

The pre-war price of monazite sand was not less than £5 per unit of thoria per ton, and that of thorium nitrate 23s. per kilo. The present price of monazite is given as £4 12s. 6d. per unit of thoria per ton at the mine in Travancore. The c.i.f. value at European ports in June last was about £6 10s. per unit; while thorium nitrate was worth 38s. per kilo. The British requirements of thorium nitrate for home consumption amount to between 75,000 and 100,000 kilos. The United States imported mantles to the value of $62,000 in 1913; but practically none in 1918, when the value of their exported mantles was $236,219. As to the United Kingdom, the figures given have been extracted from the report.

Value of Imports and Exports of Gas Mantles to and from the United Kingdom.

(Annual Statement of the Trade of the United Kingdom.)

Year.	Imports.	Exports.	
		Domestic Produce.	Foreign Produce.
	£	£	£
1913	302,576	32,566	5,650
1914	199,299	47,400	4,359
1915	236,075	93,960	4,848
1916	57,067	144,292	7,491
1917	24,106	94,058	..
1918	26,815	103,297	..
1919	31,771	88,893	..

MACHINE TOOLS AT OLYMPIA.

DURING this and the two following weeks, Olympia will be visited by all those concerned with workshop practice who can possibly get there; for the huge ground floor-space and the gallery are taken up with what must surely be the most comprehensive collection of machine tools that has ever been brought together under one roof. The mere sightseer will marvel at the engineering triumphs by which he will find himself surrounded there; while the man having need of such appliances—and the number in the gas industry is an ever growing one—can hardly fail to find something that will appeal to him. The actual placing in position even of the exhibits must have been a tremendous task; for there are well over two hundred exhibitors, and what they have to show is in many instances very big, and still more weighty than bulky. Many of the tools are in action—performing apparently with the greatest of ease seemingly impossible tasks. The exhibition is the second of its kind—the first having taken place before the war—and has been organized by the Machine Tool Trades Association, whose policy is to avoid a number of small exhibitions, and to concentrate on really complete displays at reasonable intervals. Wherever one looks, the results of the lessons of the war are to be met with. The new products from factory and workshop demanded by the war, called for new machine tools, to the designing of which the makers promptly and whole-heartedly gave their attention. The result is to be seen to-day.

There are, in endless variety, turret lathes, capstan lathes, and other appliances for general workshops; while among the many heavier types are planing machines, boring, milling, drilling, and tapping machines, and saws and shears for cutting metal. In fact, there are, one would imagine, tools to do everything that a tool can do. In the gallery, the Aerograph Company, Ltd., give practical demonstrations with their spraying equipment for the application of paints, &c., for all classes of surfaces. Directly opposite to them is a display by the British Industrial "Safety First" Association (with Lord Leverhulme as President) of specimen bulletins and other publicity matter relating to the prevention of accidents to industrial workers. The Association say that 75 p.ct. of accidents are attributable to negligence, carelessness, want of instruction, thought, or proper appreciation of danger; and they can be eliminated only if all managements and workers are educated in "safety first" principles. Their well-known pyrometers and thermometers are shown by the Cambridge and Paul Instrument Company, Ltd. Pyrometers of different kinds are also shown by the Foster Engineering Company. The Joseph Dixon Crucible Company, who are manufacturers of graphite in all its forms, display, among other articles, their silica graphite paint, pipe-joint compound, lubricants, &c. Messrs. Thomas and Bishop, Ltd., call attention to their material for treating belting, and to their "Permac" jointing material in powder form, which it is claimed will (with great economy) form any joint that can be made with sheet-jointing.

An interesting working exhibit is that of Brayshaw Furnaces and Tools, Ltd., where, in addition to a number of small tools, there are a series of gas-fired furnaces heated-up. These are for tool-hardening, annealing, heat treatment, forging, and general work. There is also a patent salt bath furnace and a crucible tilting furnace, together with a small selection of laboratory furnaces. Among the furnace-accessories displayed by the firm, attention will be attracted by their patent gas-flow indicator, by means of which the amount of gas flowing through a pipe at any given time is indicated upon a dial. The point about this, of course, is that it enables the actual gas consumption to be seen at any moment, without the necessity of taking a meter reading.

A sum of over £13,000 has so far been subscribed to the Watt Memorial Fund, which was formed as the outcome of the Centenary Celebrations last year. The object of the fund is to investigate new sources of power, and to erect a meeting place for engineers.

The fresh rise in the price of petrol has, says "Engineer," focussed attention on possible alternative motor fuels. It is understood that Mr. J. Pannebakker is in England with the object of directing attention to the claims of a new fuel which is a compound of benzole and other ingredients, for which he claims 50 p.ct. higher efficiency than petrol. Samples of the spirit are to be placed at the disposal of the Government department concerned for tests with road motors and aircraft.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING IN GLASGOW.

THE Fifty-Ninth Annual General Meeting of the North British Association of Gas Managers was held in the rooms of the Institution of Engineers and Shipbuilders, Elmbank Crescent, Glasgow, on Thursday last. Mr. R. W. COWIE, of Port-Glasgow (the President), occupied the chair. The attendance of ordinary, extraordinary, and associate members was very large—well over one hundred being present.

FINANCE AND THE COUNCIL'S ANNUAL REPORT.

The PRESIDENT said that, as would be observed from the report, the membership showed an increase of three. This figure, however, would be considerably augmented by the number of new members whom they expected to admit that day. So far as the accounts were concerned, there was one item that called for comment—namely, the sum taken from the William Young Memorial Fund to square the expenditure for the year. The amount borrowed in this way would be repaid, he hoped, during the current year, now that the general funds of the Association were likely to be improved by the large accession to membership. The Council were sorry, as, indeed, he supposed all members were, that necessity called for an increase again in the annual subscription. As they returned to normal times, the Council were hopeful that the subscription fee would be reduced.

THE RESEARCH FUND.

As would be observed from the annual report of the Council, a special appeal had been made on behalf of the Research Fund. Being largely maintained by voluntary contributions the fund was rather at a disadvantage, because, while they had no fixed income, they had an expenditure which fluctuated but little in amount. He was glad to be able to report that the appeal on behalf of the fund had been most gratifying. Already a sum of £16 had been received; so that it was possible for him to report that the Research Fund now stood in a good condition.

THE QUESTION OF EXTRAORDINARY MEMBERS.

Mr. LAURENCE HISLOP (Uddingston) raised the question of the rule governing the admission of extraordinary members. He inquired if the rule was specifically before the Council when they made the recommendations they did that day in regard to the admission of extraordinary members.

The PRESIDENT replied in the affirmative, and explained that the feeling of the Council was that the credentials of those nominated as extraordinary members—as certified by the firms they represented—were in complete sympathy with the rules of the Association.

Mr. HISLOP explained that his reason for raising this matter was to endeavour, if possible, to have the rule as it presently stood broadened in such a way that all representatives of firms would be admitted without exception. He foresaw difficulties arising if, as the saying was, they made fish of one and flesh of another. He had no wish to put forward a definite motion on the subject; but he was desirous that the point he had raised should be kept in view by the Council.

Mr. W. M. WILLIAMSON (Forres), Mr. LANG (Alexandria), and Mr. ROBERT SIMPSON (Cambuslang) generally supported the viewpoint of Mr. Hislop.

Mr. ROBERT SIMPSON (Cambuslang) thought a good way of getting over any future difficulty would be to arrange for a reconstruction of the rule so that it would read that extraordinary members could only be admitted on the approval and recommendation of the Council.

The PRESIDENT said that if notice was given by Mr. Simpson of such a motion, it could be discussed next year.

Mr. SIMPSON explained that it was his intention to give formal notice in writing of such an amendment to the rules.

SECRETARY'S REMUNERATION—THE WILLIAM YOUNG MEMORIAL FUND.

Mr. W. M. WILLIAMSON (Forres) called attention to the question of the Secretary's remuneration, as voted this year in the accounts. He also submitted that the revenue account of the William Young Memorial Fund was wrongly stated in the accounts.

The PRESIDENT said he desired to make it perfectly clear that the cash taken by the Association from the William Young Memorial Fund would be replaced.

The SECRETARY (Mr. David Fulton, of Helensburgh) said he understood the accounts of the William Young Memorial Fund were shown in the form presented in accordance with an arrangement entered into between the Auditors and Mr. Peter B. Watson, the Secretary of the Association until two months ago. The alteration in the statement of the general fund was made by the speaker personally, because he wanted the members clearly to see the amount of the total indebtedness to the William Young Memorial Fund. Probably he should also have altered the figures relative to the William Young Fund; but that there was a difficulty in getting every little detail satisfactorily adjusted in the short time at his disposal between the date of his appointment as Secretary and the holding of this meeting of the Association.

Mr. LAURENCE HISLOP said that, with the permission of the meeting, he would like to move that Mr. Peter B. Watson, their former Secretary, should be a life member of the Association rather than an honorary member. There was no disputing the fact that during the past few years Mr. Watson had rendered good service to the Association as secretary.

Mr. SIMPSON seconded the proposal, which was agreed to.

After some further discussion, the report of the Council, as well as the financial statement, was adopted.

NEW MEMBERS.

The following were admitted to the Association:

Extraordinary Member.—Mr. Robert Allan, of Messrs. W. & B. Cowan, Ltd., Edinburgh.

Associate.—Mr. A. H. Cockburn, Selkirk.

Life Member.—Mr. George Keillor, sen., Comrie.

Ordinary Members.—Messrs. John Inlach, Macduff; Harry A. Rutherford, Inverkeithing; Douglas MacRae, Aberfeldy; John M'Millan, Gourock; James Findlay, Banff; Fred. J. M'Laren, Lochwinnoch; George Hamilton, Barrhead; A. Macdonald, Prestonpans; and A. Walker, Kilbarchan.

NEW METHOD OF ELECTING OFFICIALS.

The PRESIDENT explained that the next business falling to be dealt with by the meeting was consideration of the motion standing in the names of Messrs. W. M. Williamson and G. Bruce, which was in the following terms: "All members to be elected to the Council shall be proposed and voted on at the annual general meeting."

Mr. GEORGE BRUCE (St. Andrews), speaking in support of the motion, said that if any Association connected with the gas engineering profession was needing reconstruction it was the North British Association. Personally, he had felt for a long time now that the work of the Association, so far as the gas industry was concerned, had been on a very small scale indeed. A good deal of the work formerly done by the Association had been transferred to the Scottish Gas Council—a body which it must be admitted had shown some activity. At the same time, he had the distinct and decided feeling that if the North British Association had been fully alive to its responsibilities, the Scottish Gas Council would never have been needed. In connection with the nominations for membership on the Council of the Association, there was a kind of cliqueism abroad which was very much to be deprecated. There was a strong need for reconstruction, and, indeed, he was bold enough to say that if it were not for the mutual fellowship they enjoyed at the meetings, through holding converse with each other, the Association might be regarded as of no earthly use. It occurred to him that the main duties devolving upon the Council seemed to be the arrangement and organizing of excursion parties. In the strenuous days through which they were passing everybody seemed to be reorganizing excepting the North British Association; and the necessity in their own organization was really all too apparent. He hoped the motion would receive the cordial support of members.

The PRESIDENT asked Mr. Bruce if he was correct in assuming that the exact phraseology of the motion was as handed in at the last annual meeting.

Mr. BRUCE replied that the President was right in his assumption. A year ago, however, the Informal Meeting was not being carried on under the auspices of the North British Association. That was a development that had since transpired. Doubtless, if he had known that such an event was to take place, he might have somewhat altered the terms of his motion. For example, he might have incorporated in his motion the suggestion that the nominations for the Council, &c., could be made at what was now to be the spring meeting of the Association, and that the election could take place at the annual meeting. If, following an arrangement of this kind, there happened to be dissatisfaction with the work of the Council, then the fault would be with the members who, under the system he had advocated, would have a choice of selection in the matter of nominations.

Mr. W. M. WILLIAMSON (Forres), in seconding the motion, said that the majority of the members already knew his views on this question. During the past few years, he had been somewhat critical of the work of the Council, and he had been particularly keen in deploring their inaction. All along he had inclined to the view that there was no necessity for the formation of the Scottish Gas Council if the North British Association and its Council had been doing their duty. Then he had the feeling that the Scottish Gas Council had been formed in a very underhand manner. On this topic, he had already exhausted his opinions; and on the present occasion there was no need to hark-back to it. A question had been raised respecting the way in which it was proposed to give effect to the terms of the motion now before the meeting. Personally he apprehended no difficulty. The Senior Vice-President ought to become automatically the President, while the Junior Vice-President would simultaneously step-up to the senior position.

Mr. DAVID VASS (Perth) said he felt disposed to move the previous question, not because he found himself out of sympathy with what had been said. It rather seemed to him that they were faced with a situation when the entire rules of the Association should receive the consideration of the Council. He foresaw difficulties in carrying out the motion as presented; and, instead of being in too great a hurry, it would be better if the whole of the rules were referred to a Special Committee or to the Council, for investigation and revision. He quite frankly conceded that there were a few points in the constitution that were not quite up-to-date. No doubt the rules were carefully revised some years ago; but much had happened in the interval to call for further readjustment.

Mr. BRUCE held that the amendment proposing a revision of the rules was not a competent one for consideration at this meeting, which must either accept or reject the motion as it stood.

Mr. VASS said he was quite prepared to move a direct negative to the motion as it stood. It seemed to him that an election at the annual general meeting of the Association on the lines suggested in the motion was unworkable.

Mr. JAMES DICKSON (Johnstone) deprecated the suggestion thrown out by Mr. Bruce, that there had been an element of cliqueism in the Council. In his experience of the Council there had never been any indication of what might be called a clique. As a Council, their aim had always consistently been one of endeavouring to do their best to benefit the profession. They had been out for the technical advance-

ment and improvement of the members. This, he thought, was one of the main objects of the Association. It was rather far-fetched to say that the North British Association had allowed the Scottish Gas Council to usurp their rights. As a matter of fact, the North British Association was not constituted in such a way that it could adequately represent all the interests of the gas industry in the manner the Scottish Gas Council could do. In the Association they had no representatives from the shareholding or proprietary side of the gas business. Gas managers, technically speaking, were in the same position as the rest of the workmen—simply employees. They could not represent the capital side of the industry. This was one of the reasons why the Scottish Gas Council had been called into being. It had been doing excellent work in Scotland, but its sphere of usefulness was quite different from that of the North British Association, whose main function was to look after the technical interests of the members. Laws were rarely made in which loopholes could not be found. In this respect he supposed the rules of the North British Association were in the same category as many others.

Mr. A. MILNE (Aberdeen) suggested that, with the approval of the President and the members who were present, the motion before the meeting should be altered to read: "That the members to be elected to the Council shall be duly nominated at the spring meeting and that the election shall take place at the annual general meeting of the Association."

The PRESIDENT said there seemed to be general agreement that the rules of the Association as they now stood were out-of-date. Already they had found this out in more than one instance during the course of the proceedings that forenoon.

Mr. BRUCE said, in view of the suggestion made by Mr. Milne, he would be willing to substitute for the motion standing in the name of Mr. Williamson and himself, a proposal along these lines: "That the members to be elected to the Council shall be proposed at the spring meeting and voted upon at the annual general meeting."

Mr. WILLIAMSON, in seconding, explained that it was only fair to Mr. Bruce to say that he had written to him suggesting an alteration very much on the lines of that now submitted. He (Mr. Williamson) advised Mr. Bruce by letter that it might be better, and for the avoidance of possible complications at the meeting, if the terms of the original motion were in the first instance to be adhered to at the annual general meeting.

Mr. VASS said he would now withdraw his amendment, which was against the proposal as printed and not opposed to the proposition now put forward in an altered form.

The resolution, as altered, was then put to the meeting and carried.

Mr. D. FULTON (Secretary) said that, speaking as a member of the Council, he denied the existence of cliqueism or a spirit of partizanship. There never could be that in the Council so long as they found from the experience of the past that each individual member had a mind of his own. In the selection of gentlemen to represent the members of the Council they had all along been actuated by a desire to conserve the best interests of the Association.

THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following address.

Gentlemen,—At the close of last year's meeting, I took the opportunity of thanking you for the honour you had so graciously conferred upon me by electing me President. I renew these thanks; for I appreciate very highly such an honour. In addressing you to-day, I do not intend to make a general survey of the position past and present of the various aspects of our industry, or to discuss at length the prospects for the future. I wish rather to give you a record of my own recent experiences—more particularly an account of the position of the Port-Glasgow Corporation gas undertaking.

ORIGIN OF THE PORT-GLASGOW GAS-WORKS.

The gas-works in Port-Glasgow were originally constructed in 1830 on a piece of ground extending to about three-quarters of an acre, forming part of the existing site of the old works. At that time, this ground was acquired by thirteen public-spirited gentlemen who were feuars in Port-Glasgow, and acted as Trustees for managing the public funds of the towns of Port-Glasgow and Greenock. These Trustees were the predecessors of the Town Council, which was constituted on the two towns being created into the parliamentary burgh of Port-Glasgow under the Reform Act of 1834. In 1865, the Police Act was passed, in which power was granted to extend the gas-works. Acting under this power, the remainder of the existing site was acquired, and an extension made in 1876.

There is no record of the original cost of the works; but in 1863 there appears to have been an outstanding capital debt of £2160, borrowed from owners of property and others interested in the burgh, for the purpose of improving and extending the gas-works. Neither is there any record of the consumption or number of consumers in those early days of gas supply in Port-Glasgow. The population in 1831 was 5192; to-day, it is estimated at 23,000.

Thirteen years ago, the works were considerably altered, and in some respects enlarged. The retort-bench was extended by adding two double ovens of eight retorts; also a new exhauster and one luteless purifier, 16 ft. by 12 ft. by 5 ft. deep, were put down. A sulphate of ammonia plant was erected capable of making 30 cwt. of sulphate per day. There were two gasholders—one a two-lift column-guided holder of 250,000 c.ft. capacity, and a small single-lift holder of 30,000 c.ft. capacity. This gave a storage of 280,000 c.ft.; while the daily output was 250,000 c.ft. It was decided to do away with the latter, and make a tar well of the tank. But the loss of the holder was much felt on a certain occasion recently.

For some years the works seem to have been sadly neglected; for in 1914 the then gas engineer reported very adversely on the condition of the works as he found them, and urged very strongly the erection of a complete new gas-works on another site, or at least the erection of a new and larger gasholder. The former project was most favoured; but neither was carried out. In 1914, the Town Council of Port-Glasgow realized that it might be to their advantage to get a supply of gas from the neighbouring burgh of Greenock, and save them the heavy initial cost of erecting a complete new works. They accordingly inquired on what conditions the burgh would give a supply of gas in bulk. It is a curious fact that when towns lie very close to each other, and have so many interests in common, there should sometimes be so much local jealousy, and even occasionally strained relations. There is much to be said in favour of the healthy rivalry between towns so placed bringing out all that is best in the various departments of municipal life and work, and thus obtain the highest possible efficiency at the lowest possible cost—to the advantage of the exchequers of the respective towns.

Some sort of mystery is attached to the communication sent to the Greenock Corporation; for though it was received, and a Committee appointed to deal with it, the Port-Glasgow authorities had no answer till Dec. 24, 1919—fully five years later. In 1914, when no reply was forthcoming from the Greenock Corporation, the Port-Glasgow Town Council promoted, and had obtained, a Provisional Order giving them power to borrow money, purchase land, and erect new gas-works. Certain areas of land were for sale—one on the north side, and one on the south side of the Caledonian Railway Company's line from Glasgow to the Coast, and near to their sidings and shunting yard; and both being suitable sites for a gas-works, the Town Council bought them both. After taking expert advice, they decided to build on the larger and better site—*i.e.*, the one between the railway and the River Clyde, extending to over five acres—and to keep the other site, between the main road and the railway, for a municipal building scheme.

Beyond promoting the Provisional Order and purchasing the two sites, nothing further was done to prepare for the anticipated collapse of the existing works. The fact that war had just broken out, and the general expectation that it would be of short duration, no doubt had much to do with the delay of the Council in not pushing on with the scheme at an early date. One accident after another befell the old works; and it was quite apparent that grave risks were being taken in not proceeding with the new scheme.

FIRE AT THE PURIFIERS.

The three water-lute purifiers were, and still are, in a state of serious disrepair. None of the rack-and-pinion valves are gas-tight, and some were jammed. The sides of the covers were excessively corroded and patched. The fasteners for holding down the covers seem to have been badly corroded; for one evening in the spring of 1915 one of these gave way, allowing the purifier to blow. The escaping gas became ignited at an adjacent outside lamp; and before the gas could be turned off, and the fire which resulted could be extinguished, the workshop and photometer room situated overhead were burned out. This damage amounted to £350.

COLLAPSE OF THE RETORT-HOUSE ROOF.

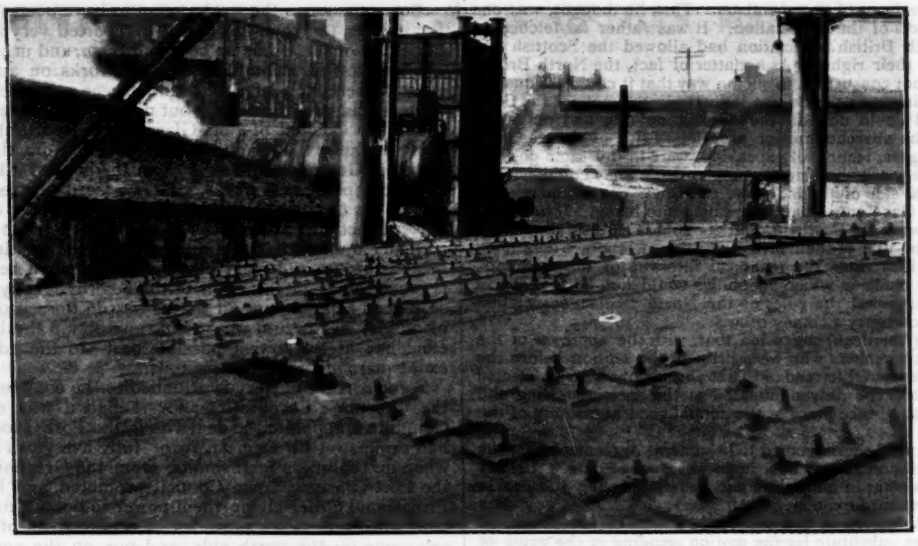
The retort-house in the old works is a building 125 ft. long by 76 ft. wide, and is retort-house and coal-store all in one—the latter being at the northern end. Inside the retort-house, at the southern end, there is a water spray for quenching the hot coke in the barrows before it is wheeled out into the yard. This quenching of coke inside the building had corroded various members of the iron roof. This being a slow but sure deterioration, and being out of reach of close observation, was unnoticed till one midsummer's day in 1917, when, without the slightest warning, a portion of the roof collapsed, bringing with it the slates and purlins. Fortunately, although the men were working as usual underneath, no one was hurt. A new portion was erected in place of that which had collapsed, and this was covered with corrugated asbestos sheeting.

The foregoing accidents happened in my immediate predecessor's time. But greater surprises were in store for his successor.

COLLAPSE OF THE BOILER.

In December, 1919, about three weeks after coming to Port-Glasgow, when the output of gas per day was about 350,000 c.ft., one morning on arrival at the works I found 30,000 c.ft. of gas in the holder, the exhausters standing, and the retort-bench enveloped in clouds of crude gas, escaping from everywhere. During the night the furnace tube of the Cornish boiler, which is 4 ft. diameter by 16 ft. long, had collapsed.

The stand-by boiler we had—a marine-type dry-back multitubular boiler—was immediately kindled, and soon everything was as usual. After a careful examination of the Cornish boiler by the Boiler Insurance Inspectors, and after due consideration of their reports on both boilers, it was decided not to repair the old one, but to depend entirely on the marine-type multitubular boiler which the inspectors said would give no trouble, as it was in very excellent condition. This proved later on to have been a grave mistake; for some months afterwards one tube after another began to give way and had to be stopped-up, till, when the winter came on, the boiler suddenly gave out entirely. A vertical steam-boiler was hurriedly procured on loan from one of the local ship



VIEW SHOWING THE GENERAL CONDITION OF THE CROWN SHEETING.

building yard; and kept working while the marine type boiler was re-tubed. During the interval of the one boiler giving-out and the arrival and fitting-up of the other, the exhausters were kept running by using the steam from our "Sentinel" motor wagon, which is used for conveying coal from the goods station to the gas-works. Our difficulties in keeping up the supply of gas were not lessened by the fact that we had only storage accommodation for six hours of our maximum demand; and once this surplus was lost, it was a most difficult matter to get it made up again. As for making a constant quality—that was, and still is, impossible.

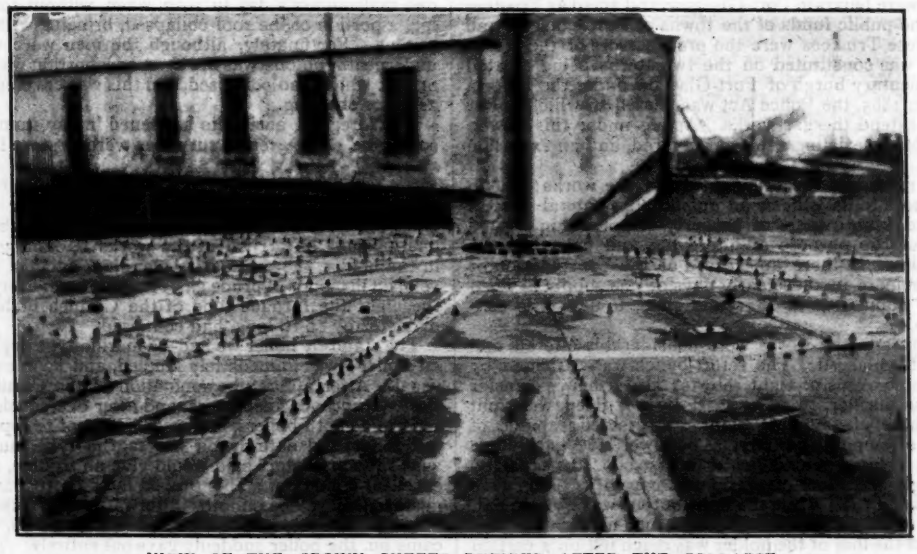
COLLAPSE OF THE HOLDER.

Of all our troubles, one of the most alarming was the sudden bursting of the crown of the one and only holder. One Saturday afternoon, at 12.30, when in the meter and governor house, having a last look around before leaving for home (seven miles distant), I was startled by the governor bell going down with a bang. On looking out of the open door, I was amazed to see the gasholder sinking at a most alarming speed. My first thought was that some mischievous person had opened the valve, or removed the stopper from the 15-in. trunk main which at that time was being laid to the site of the new gas-works. I soon perceived the real cause to be the gas blowing from a huge hole in the crown of the holder. Six plates had suddenly given way, and were standing up on end, leaving a hole some 50 sq. ft. in area. Fortunately, the furnaces in the smithy of the Clyde Shipbuilding Company, which adjoins the gas-works, were not working, or the gas might have been kindled, and would probably have fired-back into the holder, with consequences difficult to guess. I first made a careful examination of the damage, and noted what material would be required to repair it, in the way of plates, bolts, nuts, washers, &c. In this dire emergency there was no waiting on ceremony. So, entering one of the shipbuilding yards we started the machinery, sheared the plates, punched the holes, and then brought from the stores the necessary bolts, washers, screwkeys, &c. In the interval some of the stokers were making up balls of "Vulcan" cement, while others obtained planks and old doors &c., to lay on the crown of the holder to give safe footing for working.

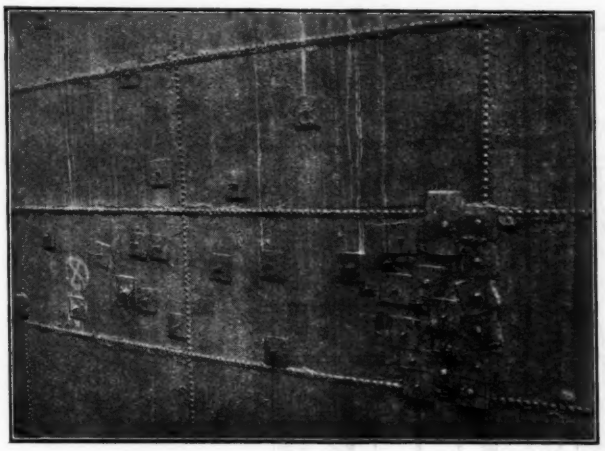
A start was made at once to re-fix the same sheets in position. Half holes were filed $\frac{3}{8}$ in. diameter on the edge of the sheets, and corresponding half holes on the edge of the sheets still comprising the crown. The plates secured at the shipbuilding yard were then put inside the crown—being previously well coated with "Vulcan" cement; and $\frac{1}{4}$ in. thick plates 4 ft. square were put on top like a large washer, and screwed tight up. This was comparatively easy so long as one could get an arm in to hold-up the inside plates. When we started to this repair, I did not at the time see exactly how the closing plate was to be fixed. As we worked, I kept thinking it over, and by the time we came to the closing plate I had hit on a plan. Having fixed securely the first four sheets, I had the $\frac{5}{16}$ in. plates cut exactly to the lengths required to go round the perimeter of the last two sheets, which were in one piece. Before laying the last two loose sheets back in position, the $\frac{5}{16}$ in. plates were slung inside the crown of the holder by passing thin wire attached to the point of each bolt and through the half hole in the crown sheeting. The sheets, being then laid down in position, the bolts were drawn-up and fixed securely with 4 in. sq. $\frac{1}{4}$ in. plates and nuts as before.

This method saved us the trouble and risk of cutting hand holes, and made a very secure job. As the holes in the holder sheeting were all filed-out, the files were previously well oiled. The same caution was taken with the chisel and hammer heads, as a spark in the hole—where by this time there was a very highly explosive mixture—would have been very serious indeed. Working till 11 p.m. on the Saturday and from 7 a.m. on the Sunday morning, we had the sheets refixed and gas going into the holder by 11.30 a.m., and the supply of gas on to the town by 6 p.m. the same day. The accompanying photographs show the sheets which blew off refixed, and the general condition of the crown.

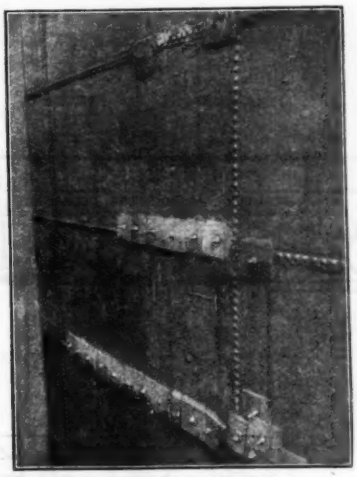
This last mishap turned out to be a blessing in disguise; for



VIEW OF THE CROWN SHEETS REFIXED AFTER THE COLLAPSE.



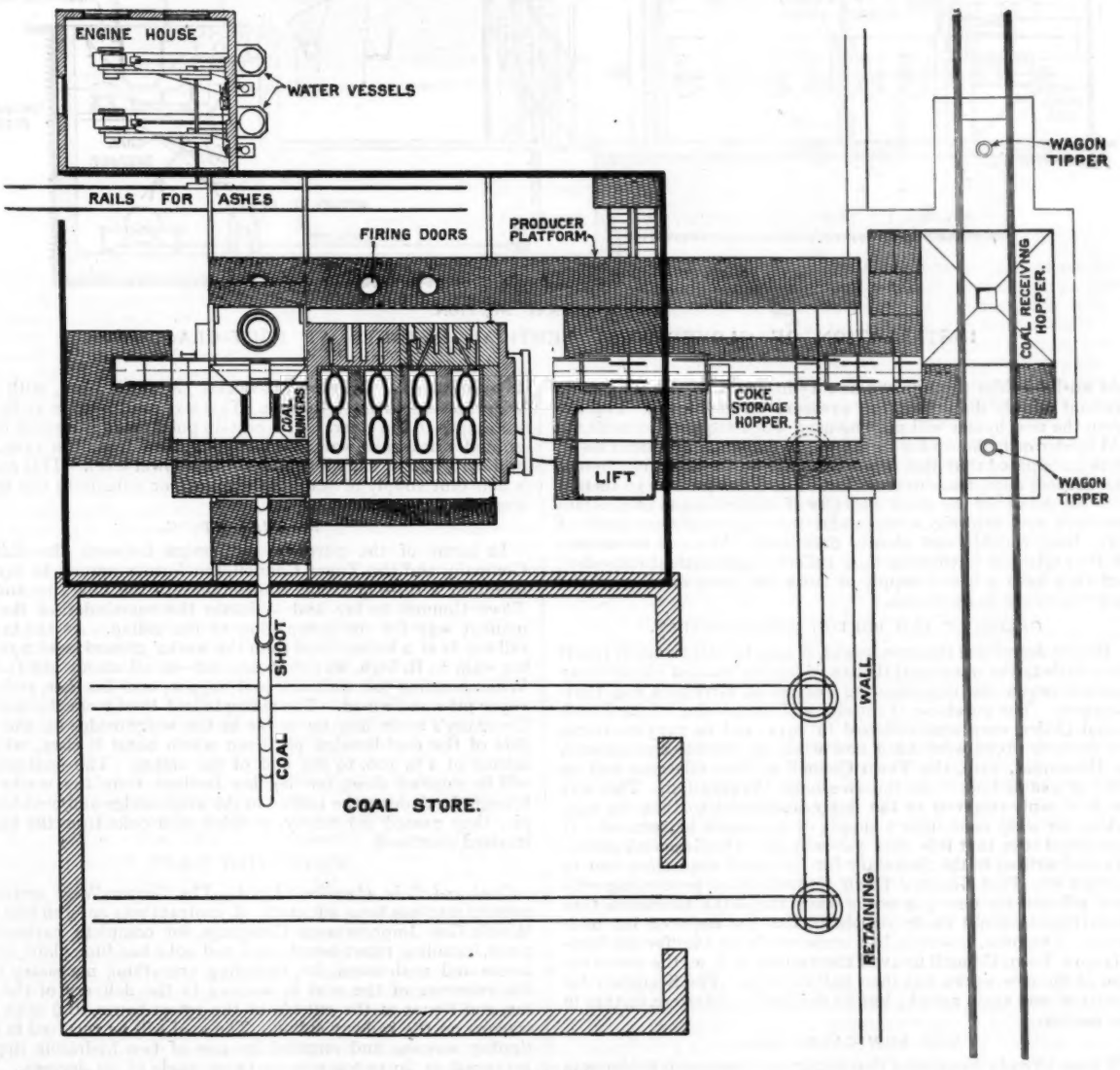
SHOWING THE CONDITION OF THE SIDE SHEETING.



THE SIDE SHEETING WHICH GAVE WAY WHEN THE HOLDER WAS LAST CUPPED.

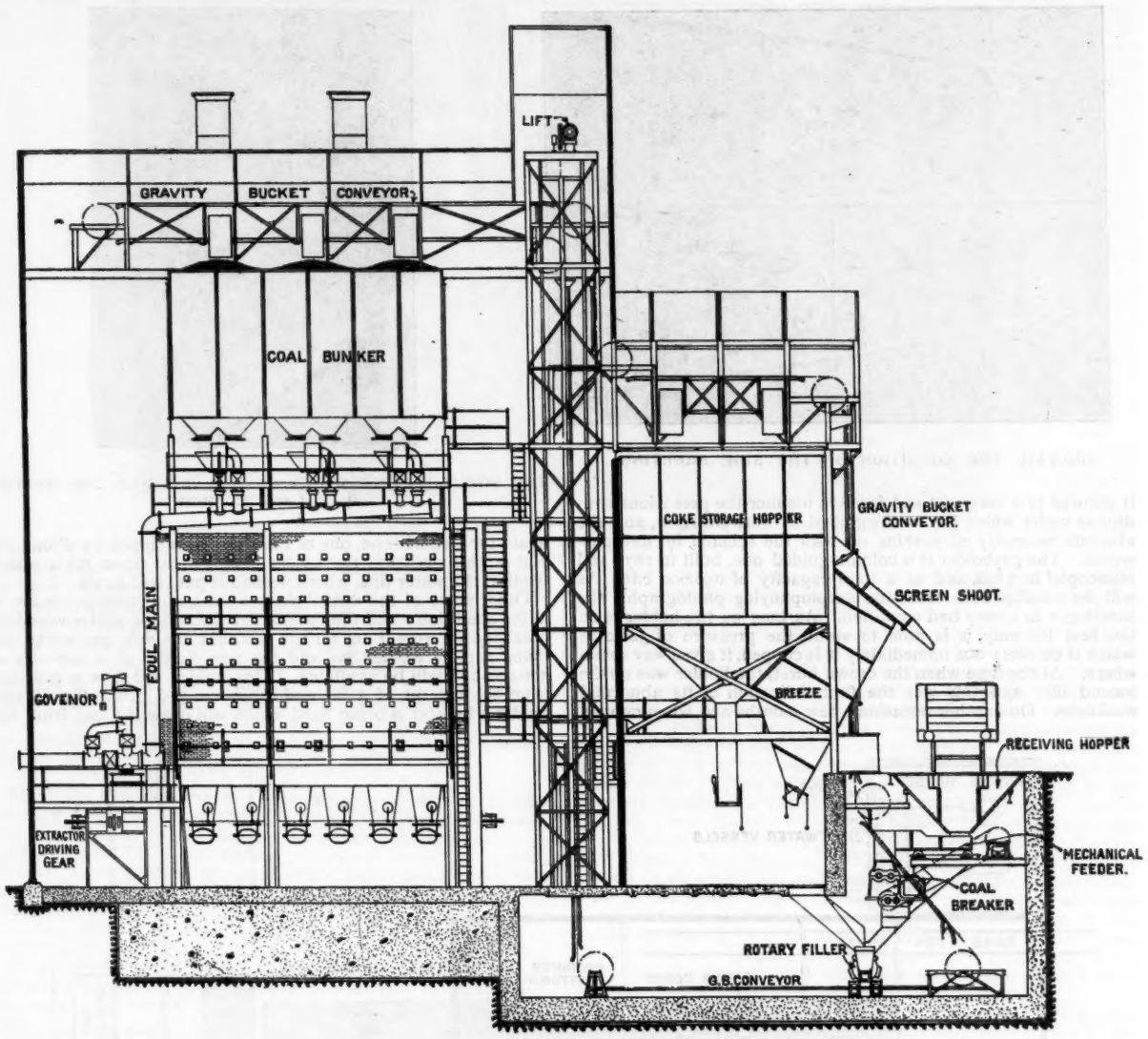
it showed in a very real and forcible manner the precarious conditions under which gas was supplied in Port-Glasgow, and the absolute necessity of pushing on with the scheme for new gas-works. The gasholder is a column-guided one, built in 1875 and telescoped in 1898, and of a total capacity of 250,000 c.ft. As will be readily seen from the accompanying photographs, the sheeting is in a very bad condition. As long as the holder is on the first lift only, it is able to stand the pressure of 32-10ths which it throws; but immediately it is cupped, it gives way somewhere. At the time when the crown burst, the holder was on the second lift; and this was the first indication of its abnormal weakness. On another occasion a few months ago, when cupped again for a short time, one of the side plates ripped for about 3 ft. But on this occasion the holder simply went down till it sealed itself at the water line, where we had it put right again.

Other parts of the works' plant, valves, and connections are in a like condition; and the outlook for the coming winter would be black indeed were it not for the fact that the new gas-works are being rapidly pushed on, and the new holder of a capacity of 500,000 c.ft. will be available. This holder will give a pressure from the top lift of 5 in., and when cupped 7 in. To fill this holder a booster is being fixed which will draw the gas from the



PLAN.

INSTALLATION OF GLOVER-WEST VERTICAL RETORTS AT PORT-GLASGOW.



LONGITUDINAL SECTION.

INSTALLATION OF GLOVER-WEST VERTICAL RETORTS AT PORT-GLASGOW.

old works' holder through the new 15-in. trunk distributing main without unduly disturbing the pressure on the town. The gas from the new holder will only be used when required to refill the old holder or make up for an increased demand or reduced make. It is anticipated that the new works will be in operation before the darkest days come next winter. I do not require to go further into the details of the great difficulty of supplying gas of constant pressure and calorific value under working conditions such as have been roughly and shortly described. The gas consumers of Port-Glasgow have been long suffering and patient for years; but they have a better supply in store for them when once the new works are in operation.

GREENOCK AND PORT-GLASGOW RIVALRY.

Before describing the new works, it may be of interest to revert for a little to the municipal rivalry which has existed for so many years between the neighbouring burghs of Greenock and Port-Glasgow. The purchase of the site and the passing of the Provisional Order were accomplished in 1914, and in 1919 contracts for the new works were fixed and work on the site commenced. In December, 1919, the Town Council of Port-Glasgow had an offer of gas in bulk from the Greenock Corporation. This was the first reply received to the letter addressed to them in 1914 asking on what conditions a supply of gas might be secured. It transpired later that this offer was sent after the Greenock authority had written to the Secretary for Scotland requesting him to prevent the Port-Glasgow Town Council from proceeding with their scheme for new gas-works when they—the Greenock Gas Department—could easily supply all the gas required for both areas. The offer, however, had come much too late for the Port-Glasgow Town Council to avail themselves of it, as the construction of the new works was then well in hand. The Secretary for Scotland was again asked; but he declined to interfere further in the matter.

THE NEW GAS-WORKS.

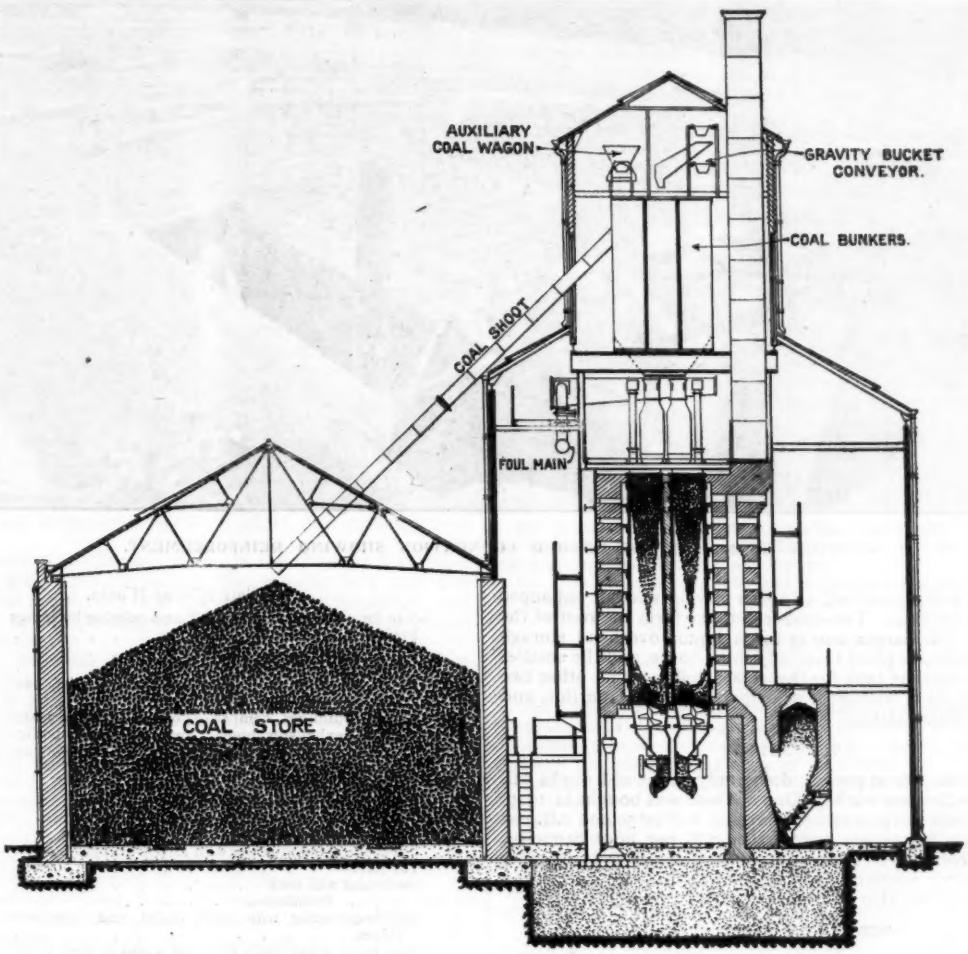
I have already mentioned that in 1914 a Provisional Order was granted and a site bought; but nothing further was done till the gasholder mishap occurred, when steps were immediately taken to proceed with the new gas-works. A small burn, with clean water, passes through the site. This was conducted in 15-in. cast-iron pipes to the river. At a certain point there is a small underground brick-built water-tank that is filled from the 15-in. pipe and overflowing back into it again at a lower level. This ensures a constant supply of water to augment or substitute the supply from the town mains.

RAILWAY SIDING.

In terms of the purchase agreement between the Railway Company and the Town Council, the former agreed to lay and maintain a railway siding connection into the new site, and the Town Council to lay and maintain the remainder of the permanent way for the completion of the siding. As the branch railway is at a higher level than the works' ground level, a retaining wall, 10 ft. high, was first erected—in all about 386 ft. long. When building this wall, the coal-hopper, coal-breaker, and conveyor pit was formed. The siding is laid level from the Railway Company's main line up as far as the weighbridge on the east side of the coal-breaker pit, from which point it rises, with an incline of 1 in 100, to the end of the siding. The coal-wagons will be shunted down on the line farthest from the works and brought back down the incline to the weighbridge and coal-hopper pit; then passed out empty, or filled with coke from the hopper situated overhead.

CARBONIZING PLANT.

Coal and Coke Handling Plant.—The Glover-West system of carbonizing has been adopted. A contract was entered into with West's Gas Improvement Company, for complete carbonizing plant, including retort-bench, coal and coke handling plant, retort-house and coal-stores, &c., including everything necessary from the receiving of the coal in wagons to the delivery of the gas, tar, and liquor at the outside of the retort-house, and coke into wagons on the railway siding. The coal will be received in end-tipping wagons and emptied by one of two hydraulic tippers, arranged to tip 10 ton wagons to an angle of 40 degrees. Two tippers are required so as to deal with wagons no matter which end comes first, as most of the end-tipping wagons are adapted



CROSS SECTION.

INSTALLATION OF GLOVER-WEST VERTICAL RETORTS AT PORT-GLASGOW.

for tipping at one end only. The coal will pass from the hopper by a feeding arrangement to the breaker and into a gravity bucket conveyor, which will elevate the coal to overhead hoppers of 48 hours' storage capacity, and also into the main coal-store by means of shoots through the roof.

The coal-store is built at the side of the retort-house, and has a capacity of 1000 tons. When taking coal from this store, it is taken by side-tipping wagons on two lines of rails laid on the floor of the coal-store to a shoot leading to the rotary filler of the gravity-bucket conveyor. This conveyor is arranged to pass over the coke storage hopper, so that the coke may be dealt with in the same way as the coal. The coke storage hopper has a capacity of 50 tons, and is provided with two outlets to railway wagons—one to carts in the yard, and one for the producer charging arrow. A breeze hopper is also incorporated in the coke-hopper arrangement, to receive the screenings from the coke going into the railway wagons and carts. An electrically-driven lift is also provided, and contains all the usual safety appliances. This lift is arranged to deal with either coal or coke should the gravity bucket conveyor be out of action from any cause. The conveyor, coal breaker, and lift are all driven by electric motors with three-phase alternating current, from the Greenock Electricity Department. From the producers there is laid on the floor a set of rails for conveying the ashes to the tip on the foreshore. Part of the ground which forms the site of the new works is "wet" ground, and can be reclaimed from the River Clyde. This gives a very extensive tip for ashes from the works, as well as a tip for ashes from the town's refuse destructor. The ground so reclaimed may be used for other extensions when necessary.

Retort-Bench.—The retort-bench consists of two settings, containing altogether twelve retorts, 21 ft. long, in units of two retorts—one setting having eight retorts and the other four. These settings are arranged in units of two retorts, so that two retorts in either setting may be in operation when required. There are three gas producers—two to the setting of eight retorts and one for the setting of four retorts. It may be regarded as certain that the practice of continuously introducing steam to generate water gas particularly at the base of the retort, simultaneously with the process of carbonization, has come to stay. In view of the fact that there is a definite limit of temperature below which water gas cannot be generated without a considerable increase in the proportion of inerts added to the gas, it becomes a necessity to be able to adjust the temperature of the several portions of the retort, not only to suit the particular coal to be carbonized, but to secure the largest volume of gas without increasing the inerts, therefore reducing the calorific value. A further point with regard to "steaming" is that in any case the temperature must be greater towards the base of the retort than is necessary when steaming is not practised. The Glover-West system was adopted chiefly because of its proved adaptability to meet these requirements; and the most interesting feature of the setting is the method of so applying the heat to the retorts.

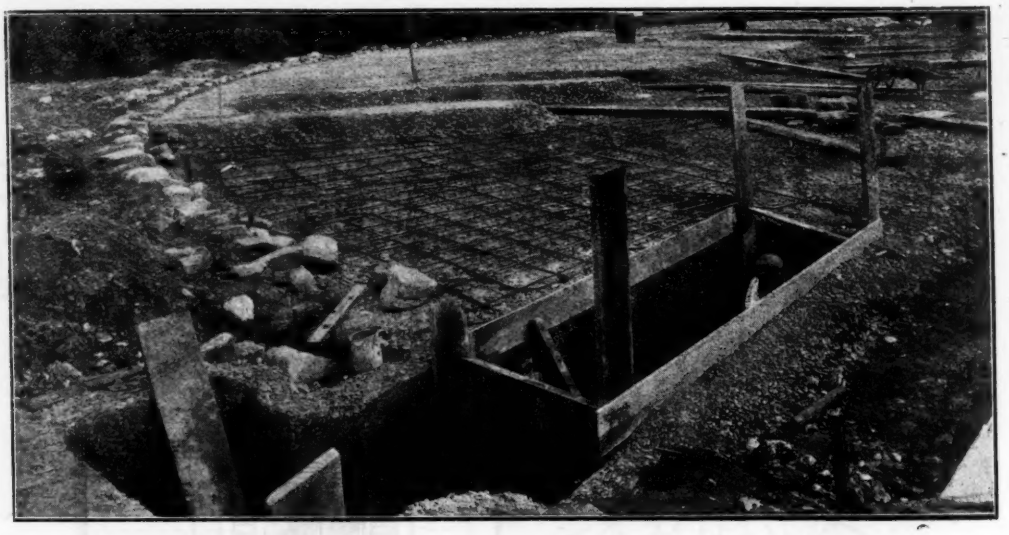
The setting is divided by vertical division walls into a series of heating chambers, each supplied by a separate vertical fuel-gas uptake, and containing two retorts. These heating chambers are again divided by horizontal partitions or floors into combustion chambers separately fed from the up-take flue and separately controlled. It is obvious then that this arrangement of heating should meet the present-day requirements of perfect control of the application of the heat. In the base of each chimney will be fixed a steam superheater, where a portion of the heat from the waste gases will be transferred to the steam required for steaming the charges in the retorts. The other features of the bench and setting are common to Glover-West's well-known system of retorting; but the accompanying plan shows the arrangement of retort-house, coal-store, and coal and coke handling plant.

CONDENSERS.

The condensers are of the water-cooled type, made by Messrs. Henry Balfour & Co. They are formed of rectangular cast-iron towers, 4 ft. square and 21 ft. high, each of a nominal capacity of 500,000 c.ft. per day. In each tower there are 121 tubes 2 in. diameter, providing 2300 sq. ft. of water-cooled surface. The gas connections are arranged with two four-way valves to enable either condenser to be worked singly, or both together, or reversed at will. The water connections are 3 in. diameter, and arranged with 3 in. diameter four-way valve to the top and bottom chambers of each tower, and arranged for similarly reversing the flow of water.

MAIN BLOCK OF BUILDINGS.

The main block of buildings on the east side of the retort-house comprises the boiler-house, exhauster house, sulphate of ammonia house, pump-house, and governor-house. By grouping these together, a saving is effected in space and in building cost. All the buildings are constructed of Robroyston bricks, built in cement mortar, the joints neatly pointed and key drawn, and the



VIEW OF SECTION OF HOLDER FOUNDATION SHOWING REINFORCEMENT.

outside walls being panelled, a further saving and an enhanced appearance is effected. Two cast-iron tanks form the roof of the boiler-house. The larger one is for a liquor overhead storage tank for the sulphate plant in an adjoining house, and the smaller one is a water-storage tank for the steam-boiler. The other two roofs are made up of steel roof principals and wood purlins, and covered with Welsh slates.

EXHAUSTERS.

The two exhausters at present doing duty at the old works will be removed to the new works. One of these was bought in 1917, in place of an old reciprocating exhauster, and is 50,000 c.ft. per hour capacity. The other is of 20,000 c.ft. per hour capacity, and in good condition. As many connections as it is possible to remove without affecting the remaining exhauster during the transition period will also be removed to the new works.

SCRUBBING PLANT.

The scrubbing plant in the old works will be removed to the new works. The Livesey washer, made and supplied by Messrs. Holmes and Co., of Huddersfield, in 1917, is capable of dealing with 1,000,000 c.ft. of gas per day. The rotary scrubber is also of Holmes' type, and was re-brushed in 1917. The tower scrubber in the old works, though of an older type, is also in fair order. After being overhauled, it will be removed to the new works when the old ones are shut-down.

PURIFIERS.

There are four new cast-iron purifiers, 20 ft. square by 5 ft. deep, formed as one box, and in line, with cross division plates. The boxes are prepared to receive two layers of purifying material. The covers, 16 ft. square, are fitted with Clapham's patent "Eclipse" joint, and are fastened to the purifier by the usual swing bolts. The lifting gear is of the "Goliath" type, running on flat-bottomed rails on top of the purifiers. The connections are 15 in. diameter, and arranged for the gas to pass down through the material. The purifiers are worked by a Weck's patent valve. Each purifier is drained to a common seal-pot to remove the water which accumulates in the bottom of the boxes.

STATION METER.

The station meter in the existing works will also be removed to the new works, but will be fitted with inlet, outlet, and bye-pass valves close to the meter, and housed near the inlet of the holder.

GASHOLDER.

The holder is a spiral-guided one of two lifts in a steel tank, all of which is above the ground. It has a capacity of 500,000 c.ft., and was built by the Barrowfield Iron-Works, of Glasgow.

Of the number of holes bored to ascertain the nature of the subsoil, two were put down on the site of the gasholder. These were practically identical with the others taken at other points, and revealed a firm bed of stiff clay 5 ft. from the surface, and no necessity whatever for piling. A small section of the ground had been made up a few years ago; and this part was well reinforced with ⅜-in. iron rods laid radially, and at the widest part 12-in. apart. These were again crossed by the same rods at 12-in. centres, and were embedded in the concrete 6 in. from the bottom. As a double safeguard against any partial set of the foundation, the whole area was reinforced with United States triangular mesh reinforcement.

PRESSURE GOVERNOR.

The pressure governor is one of Cowan's well-known water-loading type of works' governor, and is situated in a house adjacent to the exhauster-house. It is fitted with the usual inlet, outlet, and bye-pass valves.

Cost of Gas-Works.

Site for works, cost of ground, and existing buildings	£1,982
Preliminary borings on site	230
Railway weighbridge	490
Railway retaining wall	2,950
Retort-house, vertical retorts, coal-store hoist, coal breaker, conveyers, tippers, &c.	35,221
Various buildings, comprising office, workshops and stores, exhauster house, governor house, boiler-house, sulphate of ammonia house, pump-house, and chimney	12,342
Water and liquor tanks	1,512
Purifiers and foundations	4,888
Condensers	1,400
Reconstruction of sulphate of ammonia plant	1,100
Lancashire steam-boiler with forced-draught furnace	1,349
Tar pump	46
Gasholder and tank	21,380
,, ,, foundations	2,344
Station-governor with inlet, outlet, and bye-pass valves	254
New 15-in. trunk main from old works to new works	4,446
Estimated cost of removing plant from old works, including pipes and connections, &c.	4,500
Total cost	£96,334

A few of the rates culled from the builders' schedule, compared with pre-war rates, may be of interest:

Digger work	4s. per c.yd.	9d. to 1s. pre-war.
Concrete (according to mixture)	60s. to 72s. per c.yd.	14s. to 18s.
Brick work	90s. to 100s. c.yd.	12s. to 14s. pre-war.
Wood-work doors	4s. 6d. per sq. ft.	1s. 6d. ,,
,, ,, flooring	8s. 9d. ,, ,,	2s. 0d. ,,
Slating	9s. 7d. ,, sq. yd.	3s. 0d.

STEAM-BOILER.

A new steam-boiler, 28 ft. long by 8 ft. diameter, will be installed, and space is left for a second one of similar size. The working pressure will be 100 lbs. per sq. in., with reducing valve bringing the pressure down to 50 lbs. for the exhausters, pumps, scrubber, engines, &c. The boiler will be fitted with forced-draught furnaces for burning coke or breeze as fuel. The chimney is 80 ft. high and 4 ft. inside diameter at the top, giving a good margin of natural draught.

SULPHATE OF AMMONIA PLANT.

The sulphate of ammonia house is situated next to the boiler-house and the railway siding. The plant in the old works will be reconstructed at the new works. It is capable of producing 30 cwt. of sulphate per day of 24 hours. The acid will be received in tank wagons, and will flow by gravitation into a new strong storage tank, and again by gravitation into the new saturator. The stills will be dismantled and rebuilt, and a new Wilton's spent liquor valve fixed. A new Wilton's patent liming arrangement and the same makers' cast-iron vertical multitubular liquor heater will also be fixed. The existing heaters will be used as coolers. The spent liquor is easily disposed of by running it into the river. The sheet lead in the existing store will be used as far as possible at the railway siding, so that tank wagons may be filled on arrival without the slightest delay. One of the purifiers from the old works has been put down as a tar and liquor well, and the others will also be used for the same purpose after the old works are shut-down.

OFFICES, WORKSHOPS, AND STORES.

The offices, workshops, and stores are situated at the entrance to the works; and all traffic in and out must pass the general offices. These comprise a general office, engineer's room, clerks' room, lavatories, store room and workshop, and motor wagon house, and are in one line of buildings, built of panelled brick-work similar to the other buildings.

In modern gas-works and with vertical retorts, the working conditions are very much less arduous than in the case of horizontal retorts, and especially in a tumbledown place like the present works in Port-Glasgow. The comfort and convenience of the workmen have not been forgotten, and alongside the retort-house will be placed a messroom, bathroom, and lavatories.

With this site when it was bought were two houses—one at each extreme end, one of which, after being renovated, will make a suitable manager's residence, and the other, a much larger building, will be divided-up into workmen's houses.

All work embraced in the contracts was carried out according to the regulations of the Scottish National building code.

It is impossible to give a correct statement of the costs of the various contracts, as all are subject to advances in wages, &c. But the following contracts were entered into, and are now being carried out.

The capacity of the works in annual output is 180 million c.ft., and they are so laid-out that an extension to any of the plant can easily be made. There is ample room at the west-end of the site for another and larger holder at a later date.

CURRENT TOPICS.

There are many topics of extreme interest one might wish to discuss, but time forbids me trespassing further on your patience. The removal of the coal control and the great uncertainty of our coal supplies, increased carriage on coal, and the never-ceasing applications for increased wages, all effect our industry very seriously.

The National Gas Council, through the District Executive Boards, deal with these subjects as they crop-up in a way that our Association could not; and the industry has benefited, and will continue to benefit, largely from this wise handling of the various problems.

To-day we have for our consideration and discussion two papers of live interest—one on the "Reconstruction of Vertical Retorts" by Mr. T. W. Harper, of Ayr, and one on "Our New Charter—The Gas Regulation Bill, 1920," by Mr. S. B. Langlands. I hope each will promote a good discussion.

I do not wish to close this address without referring briefly to the taking over by the North British Association of the Informal Meeting of Scottish Gas Managers. It is 36 years since the late Mr. James M'Gilchrist, of Dumbarton, instituted the meeting; and its informal nature at once "caught on" with a large number of gas managers. For some years now its original informality had disappeared, but its usefulness still remained.

With the advent of the National Gas Council, Federation of Gas Employers, Commercial Sections, &c., the scope of the North British Association has been much curtailed. It is well therefore that the technical affairs of the industry in Scotland should be centred in one Association; and in future the intention is to have two meetings in the year of the North British Association.

It may be necessary now for the Council to revise a few of the rules and constitution; and I would suggest, when this is done, that it be customary for every member as he joins the Association to receive a copy of the constitution and rules. There must be a considerable number of members who have never seen such a copy.

It is to be regretted that the Editor of the "Gas Journal" cannot see his way to continue publication of the reports of Proceedings of the District Associations; and it will be necessary for this Association to revert to the old custom of publishing the report of proceedings with the "Statistical Report," as was done up till 1916.

The North British Association of Gas Managers has done much good and useful work in the past, and with the further opportunity given by a second meeting each year, combined with the loyal support and co-operation of every member, it should become more influential than ever before.

Mr. JAMES DICKSON (Johnstone), in moving a vote of thanks to the President for his address, said there did not seem to have been any monotony of existence for Mr. Cowie. The only monotony, perhaps, was the monotony of the daily existence. But even there, again, there was in the address no indication or evidence of it. There was recorded a great deal in relation to the long-suffering Port-Glasgow consumers; but if the truth were told, much also he (Mr. Dickson) felt could be said of the long-suffering Port-Glasgow gas manager as well. It was to be hoped that the sum spent in future in supplying a better gas service in Port-Glasgow would compensate the people there for the extraordinary capital charges that had been incurred. For the sake of the two communities it was perhaps unfortunate that Greenock and Port-Glasgow had not been able to come together in the matter of supplying gas facilities. But the story of the hitch that occurred was dealt with fully in Mr. Cowie's address. While the failure to have the fusion was perhaps an unfortunate circumstance, they could congratulate the Port-Glasgow Town Council in having in Mr. Cowie a most energetic manager. The manner in which he carried through the extensions as revealed in the address he had just given showed him to be a man of proved capacity and resource.

The vote of thanks to the President was cordially given.

PAPERS AND DISCUSSIONS.

The following papers were then read and discussed: "The Gas Regulation Act, 1920," by Mr. S. B. Langlands, of Glasgow [see p. 510], and "Some Notes on the Reconstruction of Vertical Retorts," by Mr. T. W. Harper, of Ayr [see p. 512].

NEW OFFICE-BEARERS.

It was announced that the Scrutineers had reported the result of the ballot for new officials to be as under:

President—Mr. James Dickson, of Johnstone (unopposed).

Junior Vice-President—Mr. John M. Smith, of Stirling.

Members of Council—Messrs. John W. M'Lusky, of Glasgow; James Campbell, of Dunfermline; Thomas Harper, of Ayr; and John Wilson, of Motherwell.

Auditors—Messrs. Spalding and Muir, C.A., of Glasgow.

PLACE OF NEXT MEETING.

Mr. DICKSON, who briefly thanked the members for electing him President for the ensuing year, said he was in somewhat of a difficulty in suggesting a possible venue for next year's meeting. According to the new arrangement, they would have two meetings next year; and, of course, as was common knowledge, the town of Johnstone was not quite a health resort. Of late years, they had been moving alternately between Glasgow and Edinburgh as the centres of their annual meetings; and he was thinking that perhaps in 1921 they should get out into the country, and away to the North at that. His proposal, therefore, would be that the annual meeting of the Association should be held in the City of Perth. As regards the spring meeting he was hopeful that the Town Council of Johnstone would be pleased to provide accommodation; but this was a detail that might conveniently at the present stage be left in his hands.

This suggestion was endorsed by the meeting.

THE PRESIDENT'S GOLD MEDAL.

Mr. ROBERT MUIR (Galston), in a few happy remarks, asked Mr. Cowie's acceptance of the gold medal of the Association for his services as President during the past year.

Mr. Cowie suitably replied; and the proceedings were then brought to a close.

THE ANNUAL DINNER.

PRESENTATION TO MR. J. W. NAPIER.

The annual dinner under the auspices of the Association was held on Thursday evening in Sloan's Resturant, Glasgow, when the proceedings were invested with more than ordinary interest, inasmuch as advantage was taken of the occasion to present Mr. J. W. Napier, of Alloa, with a handsome testimonial in recognition of the services he had rendered as Convener in arranging "Informal Meetings" during the past eight years. The President occupied the chair; and he was supported by Mr. and Mrs. J. W. Napier (the guests of the evening), Mr. and Mrs. James Dickson (Johnstone), Mr. Samuel Glover (St. Helens), Mr. Yuill (Dundee), and Mr. George R. Hislop (Paisley)—Scotland's veteran gas engineer who, despite his advancing years, looked remarkably hale and hearty. Covers were laid for fully 150.

Mr. SAMUEL GLOVER (St. Helens) proposed the toast of "The North British Association of Gas Managers." He alluded to the fact that the company were celebrating the marriage supper resultant on the union between the "Informal Meetings" and the North British Association. He was glad he had lived long enough to witness the union; and he hoped the Association would have a more prosperous and more vigorous life in the years to come.

The PRESIDENT, with whose name the toast was coupled, made a felicitous reply, in the course of which he remarked that the union between the "Informal" and the North British Association would leave the latter a stronger body. The statement had been made that, had the Association been alive to its duty, the other bodies that had come into existence would not have been necessary at all. This assertion he hotly disputed, because the North British Association would never have dealt with the economic and industrial questions that had been tackled by the Federation of Employers, the National Gas Council, and the Scottish District Executive Board. These bodies had handled, and were handling, the economic and industrial situation in a way the Association never could have done. It was interesting to note that Mr. Glover, who proposed the toast, was associated with a gentleman whose name was honoured and revered by the North British Association—the late Mr. William Young. On this occasion it was interesting to recall that Messrs. Young and Glover were collaborators in the development of vertical retorts, and if Mr. Young had been alive to-day both Mr. Glover and he would have been to the fore in the still further development of vertical retorting.

At a later stage of the proceedings, the CHAIRMAN said that they had now reached the main feature of the evening's programme. In April of the present year the knowledge that Mr. Napier had decided to resign his convenership of the Informal meetings came as a great surprise to many gas managers in Scotland. In point of fact, they had begun to look upon Mr. Napier as being as much established as the Informal meeting itself. The original informality of the meeting had long since departed; and the title "Informal" had become a misnomer. They lived in a world of change, and since 1914 the entire world seemed to have changed. Years ago, when the late Mr. James M'Gilchrist instituted the "Informal," fewer managers could muster together for intercourse, mutual improvement, and help. In addition, the opportunities for coming together were not so numerous, because then there were no such things as Commercial Sections and meetings of the kind which nowadays brought them into touch with each other almost every month. On this account, the Informal meeting formerly arranged annually by Mr. M'Gilchrist was a great boon to Scottish gas managers. Such subjects as vertical retorts were not discussed in those bygone years, but rather such topics as how to deal with choked ascension pipes, &c. Mr. Yuill, then of Alloa, but now of Dundee, took the matter up after Mr. M'Gilchrist. He was followed by Mr. M'Lusky, who conducted the meetings in a most efficient manner. Personally, he could well remember the gathering held in the Crown Hotel, Charing Cross, Glasgow, when Mr. M'Lusky, in recognition of his services to the "Informal," was presented with a cabinet. Surely it was fitting that Mr. J. W. Napier, who had carried on the duties of Convener for the past eight years, and who had shown marked efficiency and thoroughness in his work—notably during the

years of trial and stress—should be similarly honoured now that he proposed to relinquish the post. It was most fitting that they should recognize the eminent services of Mr. Napier, not only on behalf of the North British Association of Gas Managers, but on behalf of Scottish gas managers. Mr. Cowie, in a neatly phrased peroration, here asked Mr. Napier's acceptance of a massive grandfather clock, together with a diamond ring for Mrs. Napier. The inscription on the clock was as follows:

"Presented to J. W. Napier, gas manager, Alloa, by Scottish Gas Managers, in appreciation of his services as Convener of the Informal Meeting, 1912-1920—September 2, 1920."

Mr. NAPIER, who was received with considerable enthusiasm, said he had the inner assurance that this gift had not been made to him as a reward of labour, but rather as an expression of their goodwill. After all, duty was just an obligation; and it was the battle of life that those of them who had the opportunity and the ability should exercise these gifts in helping others. His duties in the past had been a pleasure to himself; and he was not unconscious that they had met with their approval. The Convener of the "Informal" meetings occupied a strangely novel position; for on him was laid the responsibility of choosing the President for the coming year. There was something to be said for this practice; and he was not at all sure it could not be usefully followed in certain aspects at least. Indeed, he was anxious that in the North British Association the routine method of appointment was apt to follow a process that—kindly or unkindly—left out those perhaps deserving of recognition. One recollected that the position of a gas manager to-day was different from the position of their professional brothers at the time of the inception of the Informal meetings. For a moment he would like to transport them back to the year 1883. It was a matter of pride and satisfaction to him that he found himself that night in the same position as did his late father, 37 years ago, when, on an occasion similar to the present—the wedding between the West of Scotland and the North British Associations—he occupied the position that he (Mr. Napier) did at the moment. His father at that time was giving up the secretaryship of the West of Scotland Association. That was a coincidence to which he might be pardoned for making reference. The Informal meeting of Scottish gas managers began in the year 1883; but a report of the proceedings was not to be found in the literature of the gas industry until the year 1886. The editorial statement went forth at that time as an explanation for publishing the report that the subjects under consideration were deemed to be of sufficient importance to the general body of gas managers to justify their inclusion. In 1886, Mr. R. S. Carlow, formerly the Secretary of the North British Association, was President, and it was an interesting reflection on the constitution of the National Gas Council to-day that at that meeting there were present the Convener of the City of Dundee and two of his colleague members. They had gone there to gain information upon a question which was exercising their minds at that particular time—namely, the matter of the illuminating power of gas. This was made the subject-matter of Mr. Carlow's address. It arose chiefly from the circumstance that the Glasgow Gas Corporation had at that time decided to reduce the quality of gas from 25 to 22 c.p.—the reason doubtless being owing to the scarcity of cannel coal. It was a curious reflection on the events of the time compared with present-day circumstances that the meeting then almost unanimously decided against the Glasgow policy, and upheld the Dundee policy of having a high quality of gas. The record showed that at that time the chief reason for maintaining the quality was that the industry was selling light; and Mr. M'Pherson was particularly strong as regards the desirability of the Corporation selling that which was of most value to the consumer and not having any regard to the economies of the situation. This was an interesting commentary on the march of the progress of events between then and now. At the present moment, conservation of coal was uppermost in the minds of legislators as well as technical men; but at that early period it was a topic that did not appear of pressing moment to the men of the gas industry. Then it was of interest to note that at that same meeting there was a discussion on Mr. Hislop's regenerative setting retorts. In speaking of Mr. Hislop, one naturally reverted to his long association with the North British Association. He was President in the year 1869—51 years ago. In 1875, he again filled the position; and, as a further compliment to his ability and inventive genius—it could be for that reason and nothing else—he was appointed President in 1887. For the third time then their grand old man, whom they were pleased to see with them that evening, filled the honourable post of President of the Association. After a personal reference to some anonymous contributions appearing in the technical press against himself, Mr. Napier passed on to remark that he supposed these gifts were given to him as a reminder of the past. It was, he said, a great pleasure for his wife and himself to be recognized in this tangible manner.

The speeches were agreeably interspersed with song and recitation. Capital arrangements for the annual meeting and the dinner were made by Mr. David Fulton, the new Secretary of the Association.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The Association last Wednesday had their first meeting and visit of the new session, under the presidency of Mr. J. Bridge (Bolton), at the Lancashire and Yorkshire Railway Company's Locomotive Works, Horwich.

The party, numbering 26, were received by Mr. J. H. Haigh (Gas Engineer to the Company), who conducted them round the extensive works—being assisted by Messrs. Orell, Bowen, and Mason, members of the staff. In the tube shop the visitors were shown boiler-tubes having the holes caused by "pitting" made-up by oxy-hydrogen welding. Just now, the works are in a position to turn-out one complete new engine in nine working days.

At the conclusion of the tour, the party adjourned to the café connected with the works and partook of tea, after which a hearty vote of thanks was passed to Mr. Hughes (the Chief Mechanical Engineer), to the Company, and to Mr. Haigh and the other gentlemen who had acted as guides. While the tables were being cleared in readiness for the after-meeting, the party were conducted round the Mechanics' Institute and Technical School in connection with the works.

BUSINESS MEETING.

On the return of the party, a special general meeting was held to consider an alteration to Rule 6, relating to the commencement of the session on a similar date to the other three Junior Gas Associations. Rule 8 was also considered, and an addition proposed that the retiring Senior Vice-President shall not be eligible for re-election to the Council for a period of three years. Both propositions were approved of unanimously.

The PRESIDENT then called upon Mr. W. H. Battersby (Bury) to read his paper entitled "Chemical Notes and Experiences in Gas Manufacture." [See "JOURNAL" Aug. 25, p. 393.]

DISCUSSION.

The PRESIDENT commented upon the creditable character of the paper. While agreeing with the author upon the necessity of the laboratory testing of coal, which should be carried out daily, these tests were greatly enhanced if combined with a practical working test, and as far as possible under similar conditions. For instance, coals intended for vertical retorts ought to be tested in a vertical retort, and not in a horizontal one.

Mr. W. L. HEALD (Preston) spoke of the gas travelling through the purifiers in parallel flow, and did not approve of this method of working. He also gave his verdict against an up-and-down flow of gas in the same purifier. As regards stoppages in hydraulic mains on vertical retorts, he had found that ammonium chloride in the tar accounted for what was called "pitching." It had been necessary to pump thin tar through the mains to eliminate this chloride of ammonia. His further remarks dealt with the lessened efficiency of the scrubbing plant when using liquor from vertical retorts, due to the high percentage of fixed ammonia as compared with liquor from horizontal retorts.

Mr. W. BUCKLEY (Manchester) could not agree in detail with all the author's findings; but upon the subject of the value of volatile matter in coke he did agree. It was a very valuable guide to what would be the behaviour of the coal that had to be carbonized in their plant. He moved a vote of thanks to Mr. Battersby for his paper.

Mr. H. J. HAILSTONE (Rochdale), in seconding, expressed his appreciation of the paper, and made allusion to the electrical apparatus for heating in certain chemical tests, speaking of the accuracy and usefulness of this apparatus.

Mr. BATTERSBY, in reply, said he agreed with the President that a practical test was best; but a laboratory test was quicker, and had to be resorted to when coal was being delivered in quantity and from a number of collieries, and all the coals different from each other.

A BENZOLE REFINING PLANT

AT THE CADISHEAD WORKS OF BRITISH TAR PRODUCTS, LTD.

Reference was made in the "JOURNAL" last week to the fact that there had been a joint visit of members of the Midland and Staffordshire Sections of the Coke-Oven Managers' Association to the Cadishead works, Manchester, of British Tar Products, Ltd., where, among many other things, the benzole refining plant was inspected. This plant may be divided, for the purposes of description, into the following five sections:

1.—The receiving and loading station.
2.—The benzole-house and refining plant proper.
3.—The receiving tanks for the intermediate products.
4.—The main storage tanks for the crude and finished products.
5.—Acid tar plant.

The Power Gas Corporation, Ltd., were responsible for the design, construction, and erection of all the material contained in the benzole house, and for the receiving tanks. They also prepared the designs for the receiving and loading station and the benzole-house building and foundation work generally. The main storage tanks and the acid tar plant were provided by British Tar Products, Ltd., to their own designs. The necessary steam and water supply, and the soda for the soda wash, are supplied from the tar-plant portion of the works; and the naphthalene recovered from the crude naphtha is also dealt with by this department.

Acid and crude naphtha are delivered in tank-wagons alongside the loading platform, and are blown across by compressed air to the main storage tanks and to the acid store tank. On the loading platform there is storage room for a large number of drums; and there is here a special weigh-cabin, with superposed tanks and special calibrated drums for the exact filling of 50 and 100 gallon drums, without spilling, by unskilled labour. This part of the plant is not at present in use—products being despatched in bulk and loaded by compressed air direct into tank-wagons.

In the washery there is space for three large (all cast-iron) washers, each capable of dealing with 4000 gallons of raw distillate per wash. At present only two washers are installed. These are of very substantial construction, and effect their mixing action by means of a pump impeller running in a horizontal plane and a superposed vertical pipe inducing a rapid double circulation movement up and down the washer, and also round the vessel in a horizontal plane. Above the washers the independent acid, soda, and water feed tanks are placed. These feed tanks are

filled from the store tanks by compressed air, which is controlled by the attendant from a point whence he can see the exact level of liquid in the tanks.

Leaving the washery, the main building is entered, passing by the auxiliary machinery, consisting of a horizontal Marshall steam-engine driving the washers and three large capacity centrifugal pumps, which are so connected that if one pump fails one of the others can always be put in circuit. These pumps transfer the crude naphtha from the incoming tank-wagons to the main storage tank, and from this tank to the primary stills. They also deliver the raw distillates from the receivers to the washers, and, when necessary, the washed products from the washed-product tanks to the stills. The washed products can also be run direct from the washers to the stills. Two air compressors are provided, to give air at 80 lbs. per sq. in. pressure when required for handling the acid and soda and still residues, and for transferring the finished products from the receivers to the main storage tanks. Air connections are also made to all the receiving tanks, so that the centrifugal pumps may have positive pressure on the so-called suction side.

There are at present four stills in the benzole-house, with their respective fractionating columns, dephlegmators, and condensers. Two of these stills were designed to produce raw 90's products; one to deal with washed products, and to produce finished products of commercial purity; and one to produce pure benzene and toluene. Room has been allowed in the house for a fifth still to be installed at a future date. The stills are all controlled from one central gauge board, where the pressure-gauges for the stills and sight-flow water gauges are assembled, together with the necessary water-valves. A water-tank is provided in the roof of the building, and fitted with an equilibrium ball-valve to ensure that the feed water to the dephlegmators shall be delivered at a constant head.

The three stills designed to handle the higher boiling fractions are arranged so that the dephlegmators can be bye-passed if desired; and these stills are also designed to work under vacuum. Special two-compartment separators are arranged in connection with these stills, to facilitate this method of working, and to provide the utmost degree of safety in working-up high-quality products. The fractionating columns are cast iron; all sections being machined. They have very large vapour uptakes, and liquid downtakes to provide the maximum fractionation at low working pressures.

The dephlegmator on the pure product still is specially designed, and is an extremely sensitive piece of apparatus, capable of producing a very sharp division of the lower boiling fractions—special draining arrangements being provided. In actual practice, and with approximately a 300-gallon flow per hour, this still has produced commercially pure benzene and toluene, distilling the requisite 90 p.ct. easily within 0·2° C.

The heating systems in the stills are of the nest-tube type, easily removable for examination. Some spare sets of tubes are stocked, in order to keep the stills in practically constant operation. The building itself is lofty and well lighted and ventilated. Extreme care has been taken in the design of the foundations to obviate any uneven settlement due to the great weight of the stills when charged—these stills being of very large size, and capable of easily distilling 8000 gallons per charge.

The receiving tanks for the intermediate and final products are interconnected, so as to provide great flexibility for grading the various products, and are all arranged to deliver their contents by compressed air to the different storage tanks and stills. No fewer than thirteen tanks of various sizes are provided for the reception of the various products obtained in the process of the refining of the crude naphtha—all being readily accessible and, where necessary, provided with steam heating coils to prevent freezing. They furnish intermediate storage for 90,000 gallons. The main storage tanks are five in number, and have a storage capacity as follows:

	Gallons.
Crude benzole	125,000
Benzole 90's	62,500
Toluol pure	31,250
Benzole pure	31,250
Solvent naphtha	31,250

The loading of the finished products is effected through the medium of two steel-blowing-eggs.

The acid tar plant now in course of construction is designed to deal with the whole of the acid tar produced in the plant, for the recovery of weak acid and naphtha.

At a recent preliminary test, some 54,000 gallons of 42 p.ct. at 120° C. crude naphtha were refined to commercial products in 96 hours; while the plant is designed to refine 6000 gallons of 65 p.ct. crude naphtha to pure benzene and toluene, and to commercial xylol and solvent naphtha per 24 hours. All the products were of exceptionally good quality, both under the distillation and the acid tests.

CADISHEAD WORKS.

The Cadishead works are situated on the north bank of the Manchester Ship Canal, practically adjacent to the Canal Company's coal-tips at Partington. Entering the works by the Ship Canal railway-sidings, there is a 50-ton weighbridge, upon which all ingoing and outgoing traffic is weighed. Adjacent are two underground concrete wells, of 80 tons capacity each, into which the incoming crude tar and oils are discharged from railway tank-wagons by gravitation. As much as 200 tons of material can be so handled each day. Between the underground wells is a pump-house, in which are situated two Lee-Howl pumps, each of a capacity of 120 tons per hour. The connections—namely, 6-in. cast-iron pipes—to these pumps are such that in duplicate their functions are:

(1) Discharging tar to tar treatment and storage tanks; (2) charging tar-stills from tar-storage tanks; (3) pumping made and purchased creosote to the creosote-storage tanks; (4) pumping creosote from the creosote-storage tanks to tank-steamers.

Following the course of the tar, the tar-storage tanks are constructed of wrought iron, and have a capacity of 1000 tons each. In order to render it possible to treat and handle all grades of tar in all weathers, each tank is provided with four steam-coils. As to the tar-stills, there are three units, each unit consisting of—

A 20-ton primary or preheating still.
A 20-ton secondary still, or tar-still.
Heavy oil condenser.
Light oil condenser.
Separating and inspection boxes.

These stills are very efficient; a distillation of 20 tons being completed in nine hours. Thus it has been possible to distill as much as 800 tons of tar in a week of seven days. The fuel used amounts to about 0·7 cwt. per ton of tar distilled. It is found that the water and practically all the naphthas contained in the tar are removed in the primary still. Further stills are in course of erection.

The various products are conducted from the stills into product receiving boilers, of which there are five, having a capacity of 8000 gallons each. One pitch cooler is provided for two stills. A feature of the plant is the use of flexible metallic pipe, with special flanges to resist heat, connecting the primary and secondary stills, and the pitch cock and cooler; the object being to obviate the danger of breakage liable to occur in a rigid pipe owing to subsidence or through expansion or contraction.

Next is a building divided into five compartments. The first compartment contains two Lee-Howl pumps and one Tangye pump. These pumps are coupled by two 3-in. wrought-iron mains to the tar-still product boilers, and can deliver and receive crude oil to and from any plant on the works. In the same compartment there is also the electrical plant for lighting the works. The next two compartments are engineers' shops. The fourth and fifth are works office and laboratory respectively.

The roof of the building is flat, and supports five storage tanks of 125 tons capacity each. A 5-in. pipe, working on a swivel-bend, allows of railway tank-wagons being filled with finished products at the rate of 20 tons in fifteen minutes.

The next plant is the carbolic acid plant, consisting of washer, causticizer, carbonating tanks, coke-kiln, dust catchers, scrubbers, and exhauster. Adjacent are the cooling-pans (ten in number), each of a capacity of 3000 gallons; the depth of oil being 2 ft. Here the naphthalene oils and anthracene oils are treated for the deposition of their solid content. Each pan contains a 1-in. steam-coil, by the use of which the solid deposit can be re-liquefied for transmission to the naphthalene and anthracene plant.

Next in order, therefore, comes the naphthalene and anthracene house. This plant is so arranged that the two processes—naphthalene and anthracene—may go on either simultaneously or otherwise. The house is built entirely of brick, is lofty, and well ventilated. Outside is a ferro-concrete floor about 20 ft. up, on which are three crystallizers, driven on shafting working at forty revolutions a minute. Inside the house there are installed three Pott, Cassel, and Williamson's centrifugals, fitted with 45-in. baskets, together with mixer-tank, pumps, and vacuum filter. The machinery is driven by a Marshall vertical engine of 25 H.P., and the centrifugals attain a speed of 750 revolutions per minute, with a load of 6 cwt. each. By means of friction-clutches, the centrifugals can be stopped without shutting-off the engine, and therefore the crystallizers and mixer continue working when the centrifugals are at rest. The mixer is divided by plates into three compartments, and may be used as a whole or otherwise. For example, two divisions and two centrifugals may be working anthracene, while the third is making naphthalene.

Returning to the tar-stills, there are just behind them, and connected to the pitch-coolers by a concrete channel, three pitch bays, holding, when full, 1500 tons each. At the end of each bay is a common loading platform, alongside which railway trucks are placed for the reception of the pitch. The arrangement is such that the tops of the trucks are on a level with the floor of the platform, and thus, when broken out, the pitch can be loaded simply and rapidly.

Next comes the steam plant, consisting of three Hewett and Kellett boilers, 30 ft. by 8 ft., each fitted with a Sugden superheater. Alongside the boilers is a pump-house, in which are installed four pumps drawing water from the Ship Canal for cooling purposes and two pumps for boiler feed. A plant for the treatment of acid tar for the recovery of acids and naphthas is in course of construction. Among the projected extensions is a plant for the recovery of pyridine bases.

Temporary Increase of Charges Act.—Orders have been made by the Ministry of Health under the Statutory Undertakings (Temporary Increase of Charges) Act, authorizing the Leeds Corporation to increase the maximum charge for gas from 5s. (authorized by a previous Order) to 5s. 3d. per 1000 c.ft.; and the Shepshed District Council, from 5s. to 7s. 6d. per 1000 c.ft.

THE GAS REGULATION ACT.

By S. B. LANGLANDS, of Glasgow.

[A Paper read before the North British Association.]

Six years ago, when the war struck the world, the gas profession little thought that their industry would be tested and tried almost to breaking point ere peace came again. It was an industry with the strength of years, an industry whose growth and vigour were shown in the perfection and accurate design of its plant and machinery, its splendid organization, and its sound financial standing. Gas shares were gilt-edged securities. Its service to the country during the war was almost its undoing. The recovery of toluol, the control of coal, of coke, and of sulphate were willingly acquiesced in, yet but meagrely acknowledged. The coal control, it might be noted in passing, emphasized the foolishness of attempting to govern the supply of coal by restricting the distance of railway transport. Coal for gas making might have to be drawn from a very wide area. Restraints and restrictions have now been slowly removed; and the Government, in a leisurely manner, eventually drafted and submitted to Parliament what our technical journals at the outset called the Gas Relief Bill, and what is now finally known as the Gas Regulation Act.

It is this Act which I think merits our attention to-day. Will the Act be a charter of freedom, will it permit the gas industry to become again a progressive industry, are questions that must be asked and answered by us. Possibly it was well that the South Metropolitan and the South Suburban Gas Companies submitted their cases to Parliament ere the Government measure was laid before the House, as they clearly stated the case for the industry in relating their own needs. Certainly they spent money on their submissions which the other undertakings in the kingdom will not now be called upon to spend. The Gas Regulation Act, investing as it does the Board of Trade with very ample powers, should mean the simplification of procedure in matters over which the Government claim jurisdiction.

The completed Act is very different from the crude Bill as it first appeared. Much work must have been done in a quiet, effective way to make the Bill a useful and workable Act; and only those who know the inner side of the preparation of parliamentary Bills can appreciate the vast amount of patient, untiring effort that has been expended by the National Gas Council and individual members of the gas profession.

PRICE AND QUALITY OF GAS.

Section 1, sub-sections (1), (2), (3).—The Gas Regulation Act will of necessity be read in conjunction with any Act under which a company or corporation at present work, and will automatically repeal clauses dealing with price and quality, method of charging, and testing of gas, as also parts of the Gas-Works Clauses Act and the Sale of Gas Act.

The Act gives power to the Board of Trade to alter or modify the maximum price of gas. The first use of the word "therm" as a unit of charge occurs. I deal with the question of the making-out of gas accounts on this basis later on. Ample scope is afforded by the Act for the easy movement of tariff rates.

Section 1, sub-section (4), brings out the scope of the Order which the Board of Trade may make.

Clause (*a*) calls upon undertakings to notify the calorific value of the gas which they purpose supplying; and if this value is accepted, it becomes the fixed and declared value, and publication along the lines indicated must then be made. This fixing of the calorific value will require careful consideration; and a fair margin should be allowed for winter's excessive demands on the plant and other contingencies which may arise. Gas engineers know to their cost that difficulties in gas manufacture have arisen in the past which altered materially the calorific value of the product of their works.

In clause (*b*), an interesting point emerges. It states that if the declared value of the gas differs materially from the existing value supplied, the undertakers will require, at their own expense, to alter and adjust or replace burners of every kind, so that the highest possible results may be obtained with the declared calorific value. The words "at their own expense" are somewhat misleading. It would look as though something were to be given for nothing; while really this is not so. The cost of the alterations will obviously become part of the working costs of the gas supply, and ultimately a charge on the price of gas. It will not alter the dividend of a gas company. Otherwise the clause is a good one; and the doing of this work by the gas undertakings should result well for the consumer and the supplier. It remains to be seen whether, from this initial adjustment of burners by the undertakers, a system of efficient and regular maintenance of gas appliances by them, at a price, will be carried out.

Clause (*c*) continues the existing extra charge for gas taken through prepayment meters; and I think there can be no two opinions as to the fairness of the extra charge for the extra first cost of the meter. Meter-rents could not satisfactorily be collected in any other way. The imposition of any meter-rent is, of course, and always has been, a debatable point.

Clause (*d*) is merely the open door for unforeseen adjustments.

Clause (*e*) fixes the date when any Order obtained shall become operative.

Clause (*f*) confirms an Order as part of the Gas Regulation Act.

Sub-section (5) affords the Board of Trade power to move in the matter of making an Order when the undertakers have taken no action.

Sub-section (6) is merely a reference to the method and necessity of publication by the undertakers of their intention to ask for an Order.

In sub-section (7), it will be seen that the number of thermal units gross, instead of the number of thermal units net, has been introduced, as also the words "saturated with water vapour." This latter sentence regarding the saturation is merely to get the gas in such a condition that it will not take up more water vapour within the calorimeter.

COMPOSITION AND PRESSURE OF GAS.

Section 2 of the Act is certainly distinctly interesting, and of importance at a time when views as to gas composition are so varied and divergent.

Sub-sections (1) and (2).—At the sulphuretted hydrogen clause no one will cavil; neither is the minimum permissible pressure of 2 in. at all unreasonable. It should be observed, however, that this pressure must be maintained not merely in mains, but in services having a minimum internal diameter of 2 in. The Board retain power to stipulate different *minima* for different parts of any undertaking or for gases of different consistency. The relaxation to allow of the separate supply of a low-grade gas for industrial purposes should be carefully noted, as also the retention of powers by the Board to make special conditions for the supply of such low-grade gas.

Sub-section (3) is a clause to keep in force any stipulations made as to pressure by Special or Local Acts of Parliament which are in excess of that prescribed by the new Act.

Sub-section (4).—It will be noted with satisfaction that the Board of Trade in this clause are empowered to hold an inquiry into a subject which has exercised the mind of the profession for many years—that is, the percentage of carbon monoxide which it is desirable to allow in a gas supply for domestic purposes. It is expected that the result of this inquiry will be to lay the bogey of carbon monoxide. The Board also are empowered to prescribe, after investigation, the percentage of inerts which will be allowed in gas. The findings on this matter should determine what are harmful as well as what are inert gases. There is a wide difference, of course, between harmful gases and inert gases.

RESTRICTION ON POWER TO CHARGE FOR THERMAL UNITS.

Section 3.—Read with section 1, sub-section (5), section 3 is really a compulsitor on undertakings to apply for an Order under the Gas Regulation Act.

On this whole question of charging for thermal units it might be worth while discussing the form of gas account which will be rendered to consumers. Will you still render the account in cubic feet, putting prominently on the face of the account form the declared calorific value and the minimum permissible pressure, allowing the consumers to make their own computation as to the value received in therms of the gas? To render the account in therms would mean much extra clerical work for large undertakings, without any apparent gain. The meters will still register in cubic feet; and a consumer wanting to check his gas bill must in the first instance read in cubic feet from the meter index. If all declared values were (say) 500 B.Th.U., computations would be very simple matters; but, if (say) 475 or 480 were taken, the arithmetical working is not quite so simple. With 500 B.Th.U. as the declared value, 200 c.ft. would obviously become a therm. The trend of the present day is shown by the attitude of the advocates of the decimal system—that is, towards simple, direct, and uniform counting. The Act binds you, I am afraid, to set forth the standard or maximum price per therm, therefore the total cost of the therms supplied. As well as the declared calorific value and the permissible pressure, the standard or maximum price per therm must be plainly printed on the account form. The gain to the consumer in declaring the calorific value of the gas lies more in its rigidity as a declared value than in its elaboration on an account form. To take an analogy, if an electrical undertaking intermittently varied its voltage, trouble would at once arise in the supply area. In the same way trouble in the past has been caused in gas supply areas by varying calorific values and pressures.

TESTING OF GAS.—APPOINTMENT OF GAS REFEREES AND EXAMINERS.

Section 4.—The choice by the Board of Trade of Gas Referees and a Chief Gas Examiner will naturally be a matter of interest to the profession. Business men fully versed in gas-works practice, and preferably men who know the entire evolution of gas engineering, would, I fancy, be most acceptable; and the same remarks will apply to the appointment of gas examiners by local authorities.

Sub-section (3).—The local authorities are to appoint the gas examiners, and (*a*) one gas examiner may act on behalf of a number of local authorities, (*b*) a county council may appoint a gas examiner. Whether this means that they make an appointment on behalf of a local authority within the county, or appoint a gas examiner over and above those appointed by the local authorities, is not quite clear.

Sub-section (4).—If the local authority does not exercise this

right to appoint a gas examiner, the sheriff in Scotland may make such an appointment on the requisition of not less than five consumers.

POWER TO PRESCRIBE TESTS.

Section 5 (1).—The Gas Referees shall prescribe: (*a*) The place, time, instruments, and methods of tests; (*b*) also the method of verification of the instruments; (*c*) and the time and form of reports to be made by the gas examiner to the Gas Referees, and the local authority or sheriff, and to the undertakers and general public.

This looks like a multiplicity of reporting; and one wonders what would happen if any of the parties mentioned differed from the others regarding the report. Existing testing-places may be taken as testing-places within the meaning of the Act, unless objection is taken thereto by either the undertaker or the local authority appointing the gas examiner; but the Gas Referees may call for additional testing-places.

Sub-section (2).—Works having an annual make of over 100,000,000 c.ft. must instal a continuously recording calorimeter. It will be seen, however, that the Gas Referees may call for the introduction of a recording calorimeter in smaller works.

Sub-section (3).—The duty of providing and maintaining to the satisfaction of the Gas Referees the testing-places and apparatus is put upon the undertakers.

Sub-section (4).—As is only fair and just, a representative of the undertakers may be present at the time of examination and inspection by the gas examiner, or when he is calibrating the instruments. But he has no right of interference. A gas examiner in testing-places outwith the works must notify the undertakers of his intention to make tests.

Sub-section (5).—The Gas Referees are given the right at any time to enter and inspect gas-works—in fact, they may make themselves *au fait* with the whole practice of an undertaking without notification.

Section 6, sub-sections (1) and (2).—The Chief Gas Examiner appears to be the ultimate Court of Appeal. Appeals may be made to him on the decisions given by the Gas Referees; and undertakers may also appeal regarding any report of a gas examiner to the Chief Gas Examiner.

Sub-section (3).—Full powers are vested in the local gas examiner—always, of course, with the right of appeal to the Chief Gas Examiner. Appeal must be made within the prescribed time.

Section 7 is purely a matter for the Board of Trade and its officers. It is to be noted that Parliament is advancing moneys for the first two years, until the actual expense of working the Act is discovered. These moneys shall be repaid, within the succeeding three years, out of the fund created in accordance with sub-section (3). The fund shall be made up of a contribution by the gas undertakings of a sum which will not exceed 3s. for each million cubic feet of gas sold. The Board will each year, not later than Jan. 15, determine the amount of the rate to be prescribed.

FORFEITURE AND PENALTIES.

Sections 8 and 9.—It is barely worth while dealing with these clauses, because we may take it that gas undertakings will be as eager to meet the wishes of the Board of Trade as the Board may be to exact observance of their rules; and undertakings are safeguarded if any deficiency comes within the wording commonly used on bills of lading and such documents—"Always excepting acts of God or the King's enemies." The full rigour of the law, however, would be meted-out where there was culpable negligence or attempts to evade.

In section 9, sub-section (4), difficulties may arise. The intention of the sub-section appears to be the placing of penalty moneys which are to be exacted for deficient average calorific value towards the reduction in the price of gas in the case of a local authority, and towards the revenue account in the case of a company. The trouble would be in the computation and application of these. Why does the Act permit the continuing deviation from the declared calorific value? It appears to be inviting trouble.

SPECIAL ORDERS—POWER TO MAKE SPECIAL ORDERS.

Section 10 is especially valuable to gas undertakings, because the Board of Trade may make Special Orders to deal with matters which heretofore have required an Act or a Provisional Order. These Special Orders would grant the following facilities:

(*a*) Gas undertakings may take gas in bulk from any source within or without their authorized limits of supply. This power apparently foresees the taking by large undertakings of coke-oven gas.

(*b*) They may give a separate supply of gas for industrial purposes within their limits of supply.

(*c*) Would allow local authorities to supply gas to districts beyond their own districts if these were not served by any other undertaking or within the area of supply of any undertaking which they had acquired.

(*d*) Such matters as the acquisition of works will also be dealt with.

(*e*) Would permit the creation of superannuation and like funds.

(*f*) The raising of additional capital or the borrowing of money for the purposes before detailed.

(*g*) Make provision for the redemption of burdens like debenture stock and mortgages. This should cover the acquisition of gas annuities.

(*h*) The Special Orders would annul or modify Special and Local Acts. The Special Orders, of course, must be submitted like a Bill or Provisional Order to both Houses of Parliament.

GENERAL.

Sections 11, 12, and 13. These three sections are for the amendment and repeal of the Sale of Gas Act, 1859, and provide for the control of gas-meter testing in accordance with present-day requirements.

Section 11 allows for the revision of the fees chargeable for testing meters—those fixed by the Sale of Gas Act having become totally inadequate.

Section 12 applies sections of the Weights and Measures Act, 1904, with regard to the verification of standards and the permissible instruments for the measuring of gas. New types of meters brought on the market must now therefore be submitted to the Board of Trade for approval as efficient measuring instruments.

Section 13 calls for the stamping of all meters in use between buyers and sellers of gas.

Section 14 requires all future inspectors of gas-meters to qualify by examination.

It is gratifying to those concerned with gas-meter testing that the above changes introduced by the Act are all on the lines of suggestions made unanimously by a joint conference of the parties interested which was held this year prior to the passing of the Gas Regulation Act. The conference was composed of representatives of local authorities engaged in the administration of the Sale of Gas Act, representatives of the Association of Statutory Inspectors of Gas-Meters, representatives of the Institution of Gas Engineers, and representatives of the Society of British Gas Industries. The results of very full consideration and discussion were embodied in a memorandum of suggestions for new regulations of gas-meter testing, to which all agreed. This was submitted by a deputation to the Board of Trade. The reception was most encouraging; and it is hoped that the recommendations of the conference on the various points of procedure other than those so satisfactorily settled by sections 11, 12, 13, and 14 of the present Act will be taken into consideration by the Board of Trade in framing regulations for gas-meter testing. The important feature of the Act is that it gives the Board full powers to prescribe such new rules in detail for the testing of gas-meters, and to amend the obsolete provisions of the Sale of Gas Act—see, in particular, sections 12 and 19.

The remaining submissions of the conference may be outlined as follows: In the fixing of testing-stations the convenience of gas-meter manufacturers and gas undertakings should, in the discretion of the testing authority, be considered, so as to avoid expense and damage in handling. Inspectors need not test every meter themselves; and the legality of tests conducted by assistants should be recognized. A meter should be tested first for soundness or leakage of the meter case under a pressure of 5 in. (under the existing law 3 in.) and with closed outlet (at present partly open). Secondly, a new test should be made for unregistered gas—the meter being run through at least one revolution or complete action under a pressure of 5 in., and at a slow rate. For instance, 1 c.ft. per hour with a 5-light meter. The third test would be for registration at a pressure of 2 in. (instead of 5-10ths as at present); the tolerance for error being, as now, 2 p.ct. over and 3 p.ct. under the actual quantity passed. Fourthly, a new test should be made for capacity if the inspector considers the capacity per hour marked upon the meter unduly high. This test should be made under the same conditions as the registration test, except that the rate per hour should be equal to 100 revolutions or complete actions of the measuring capacity of the meter, or such other number of revolutions as might be determined by the Board of Trade. Incorrect registration or undue oscillation of lights under these conditions would be faults which would condemn the meter. A fifth (also a new) test should be made, if deemed necessary by the inspector, in order to find whether the meter is absorbing excessive pressure.

The conference also recommended that the embargo of the Sale of Gas Act upon overdriven meters should be extended from purchased meters to those hired or lent free of charge. Permission is sought to supply gas through a meter not fitted with a backstop. This is obviously for meters used for power purposes. Suggestions are also made regarding the correct badging and stamping of meters. Power is asked for inspectors to test meters *in situ*. High-pressure gas is defined as gas at any pressure exceeding 10 in.; and suggestions are made regarding the methods of test and calculation for high-pressure meters. Protection is sought for meters against suction by pressure-raising machinery or gas-engines; anti-suction valves or anti-fluctuators to be fixed at the cost of the consumer. The conference decided that index testing was not practicable.

Section 15 merely deals with the furnishing of accounts and details of working of gas undertakings to the Board of Trade, and the publication of such accounts.

Section 16 appears to be merely a section amplifying powers already taken. Its purport is, therefore, to cover any omissions in draftsmanship of the Act.

Section 17 is a very interesting section. At least, it is one of those of which one would naturally say, What does it mean? It appears that at some time the powers of the President or other official of the Board of Trade were questioned in so far as they had acted as individuals, and had not allowed the Board to speak as a corporate body. The dictum must be remembered that the

most satisfactory committee for getting work done is the committee of one.

Section 19 is the making of assurance doubly sure as to the powers of the Board.

Section 20 apparently explains where the moneys are to come from for expenses other than those incurred by the Board of Trade—that is, for such disbursements as undertakers' promotion expenses, the payment of district gas examiners, also costs of gas-meter testing stations.

Section 21 is the necessary modification for allowing the application of the Act to Scotland and Ireland—the legal procedure in all three countries differing very widely.

The schedule at the end of the Act is concerned with the publication by the undertakers in a manner satisfactory to the Board of Trade of any application for an Order, with the correct method of stating objection, and with the procedure for a public inquiry by the Board of Trade.

It will doubtless be noted that many of the provisions of this new Act are merely continuations of powers already possessed under older General Acts like the Sale of Gas Act, the Gas-Works Clauses Act, the Calorific Power Act, 1916, &c. Of course, all Acts of the country have been subject to the laws of evolution in like manner.

I think it may be taken that the Gas Regulation Act is an honest attempt to conserve the interests of gas suppliers and users alike; and now it only remains for the Board of Trade to speed-up the appointments of their Gas Referees and Chief Examiner, so that the Act may become operative at the earliest possible moment. It would be noticed that no application can be entertained by the Board of Trade before Oct. 1 next. There is a striking similarity in the power which the Board of Trade will under the Act exercise over gas undertakings to that which they already exercise over electrical undertakings.

One final point I would like to make. In days gone by, the gas industry saw the vision glorious, took large views, sane views, and profitable views. In the years to come, may it still have this width of horizon!

This paper is not intended to be an exhaustive exposition of the Gas Regulation Act, rather it is an effort to get such a discussion as will be helpful in the application of the Act by all of us.

DISCUSSION.

The PRESIDENT (Mr. R. W. Cowie, of Port Glasgow) said it was rather unfortunate for the discussion that, after reading his paper, Mr. Langlands had been obliged to leave, in order to attend another meeting. The author, however, had indicated that if questions were handed in, in writing, he would be pleased to reply to them. So far as he was personally concerned, he knew very little about the Act. His position was that his time had been fully taken up in the dismantling of the old plant at Port Glasgow and the reconstruction of the works there. There were, however, present at the meeting one or two gentlemen who had taken a considerable part in the formation or building-up of this new piece of legislation; and it was quite possible they might be able to contribute something useful to the discussion.

Mr. SAMUEL GLOVER (St. Helens), responding to an invitation from the President that he should address the meeting, said he had determined that, being a visitor, it was not for him to embrace the opportunity of discussing the paper or of asking questions in connection with it. Though this might be one of the places where the Act could be fully discussed later on, he was not altogether sure the opportune moment had as yet arrived. This much, however, he believed he could say with some degree of assurance, that the Act would be interpreted in the spirit in which it had been drawn up, and that members would find that the legislation would apply to their individual cases in accordance with their circumstances. While he disclaimed having had much to do with the drafting of the Act, he must recognize the fact that the Board of Trade had certainly treated the industry in this matter in a manner which had helped towards a free interpretation and a full expression of the industry's feeling and duty towards the communities they served. Notwithstanding what Mr. Langlands had said about the Act having first of all been called one thing and then another (until it finally emerged as the Gas Regulation Act), and notwithstanding his reference to the measure having been "shuttlecocked" about from one department to another, it had to be recognized that the department to which it ultimately went had the good sense to consult the industry before they began to frame regulations that affected so seriously the industry as a whole. This, to his (Mr. Glover's) mind, was something to be thankful for. At the outset of the paper, the author raised two important questions—"Will the Act be a charter of freedom; will it permit the gas industry to become again a progressive industry?" On these points he (Mr. Glover) would like to say that he believed the Act would be found and proved to be an Act of very considerable freedom for the industry. It would not be such a freedom as would be allowed to become license; and, after all, true freedom did not degenerate into license. He was confident it would be such a freedom as would permit the gas industry to be a progressive industry. The question addressed by Mr. Langlands took this form—"Will it permit the gas industry to become again a progressive industry?" On this point he (Mr. Glover) would like to say that he thought the gas industry had continued to be a progressive industry. Progress, even during the war, had been continuous; and he believed it was bound to happen under the new Act that the industry would be progressive.

The discussion then closed; and a vote of thanks was passed to the author.

The fuel economy scheme of the Federation of British Industries has now come into operation, and Mr. G. W. Andrew, M.Sc., F.I.C., the Technical Assistant, has taken up his dutles. A number of members have already asked for advice in regard to their gas-producer or steam-raising plants.

SOME NOTES ON THE RECONSTRUCTION OF VERTICAL RETORTS.

By T. W. HARPER, of Ayr.

[A Paper read before the North British Association.]

On being approached by the President for a contribution to be discussed at this meeting, I had some doubt as to my ability for such an important function; but being fully conscious of the fact that it is the duty of every member to do the best he can for the benefit of the Association, I have decided to lay before you my experience at the Ayr Gas-Works in the reconstruction of the Woodall-Duckham vertical gas plant, which had been giving anything but satisfaction. It had only been in continuous use about four years; yet from all appearances, and the state it was in, the plant seemed to have passed through a long period of hard usage. The question might be asked what was the cause of the trouble through which the plant had passed. The answer to this, in my opinion, was the want of efficient labour and the effect of bad labour during the years of war, more especially in the last two war-years.

DESCRIPTION OF PLANT.

Our carbonizing plant consists of eight vertical retorts designed on the continuous principle, and grouped together in four units of two retorts each, having the producer in the centre of each unit, with the regenerator just below the producer furnace. The retorts are square in section, measuring 1 ft. 6½ in. by 5 ft. 3 in. at the bottom and tapering to 7 in. by 3 ft. 10 in. at the top, and 25 ft. in length. The throughput of each retort is 5 tons per twenty-four hours, and a total throughput 40 tons a day—giving a make of 400,000 c.ft. of straight coal gas per day for the whole plant.

Each unit is provided with its own hydraulic main or seal-pot having arched off-take bridge-pipes attached. These are provided with a rotary faced valve, so that each retort can be shut off from its neighbour if required. Water seal-cups are provided on each off-take pipe for cleaning purposes. The retort bottoms are fitted with a horizontal rotary coke extractor; and under the extractor is fitted a cast-iron hopper for receiving a three hours' make of coke—the coke being discharged through a water-sealed rotary door.

The coal and coke handling plant consists of a 30-cwt. steam-driven hoist, whereby all the coal and coke is elevated to the overhead storage hoppers. These hoppers have a capacity of twenty-four hours maximum consumption, which quantity can be filled in or taken out without trimming. There is provision for a "D. B." coal and coke conveyer; but unfortunately this has not been installed. All power required for the plant is derived from steam-engines; the extractor engines being in duplicate.

The plant being completed, a start was made to produce gas about the beginning of October, 1914. It appears that there had been difficulty in obtaining sufficient heat in the settings. This was due to faulty chimney pull, as the vertical plant had been coupled to the existing chimney attached to the horizontal settings and boiler. To improve the draught in the waste-gas flue, the height of the chimney was increased by 20 ft., but without any apparent improvement. About July, 1915, a separate chimney was built, 5 ft. 9 in. at the waste-gas flue, tapering to 3 ft. 1 in. at the top, and 120 ft. high. When this was completed and coupled to the vertical settings, the heats improved and better results were obtained.

About the end of 1916, labour troubles were beginning to be felt, due to the calling-up of men for military service; and from this time onward the plant did not receive all the attention to which it was entitled. It was not uncommon for the manager at that time to turn in and do a night's stoking, and carry out his other duties during the day. The climax arrived for the fair working of the plant owing to a fatal accident to the two remaining stokers. From this time onward the working of the plant was carried out by the manager, with the assistance of whatever labour he could get, which was composed mostly of women; so that the plant gradually depreciated, until such time that it was next to impossible to make good gas and meet the demand.

On taking up the management of the Ayr Gas-Works, it was my first duty to examine the plant, and find out what amount of repairs were required to put it in good working order. My attention was first directed towards the retorts; and after getting inside them, it was found that the brickwork was badly bulged and split. The splits extended through the panel-work into the combustion chambers and down the retorts to a distance varying from 9 ft. to 15 ft. This damage was evidently due to overheating for the bulging, and to explosions for the cracked brickwork. Examinations of the auxiliary coal-hoppers found four of these split—also due to explosions. The next part of the plant to receive attention was the coke extractor, hoppers, and dischargers. The extractors were found to be in fair condition, and beyond receiving a general overhaul they are in good working order. The most serious damage was found in the coke-chambers and the coke-dischargers. As many as 70 plates were found to be in such bad condition that it was decided to fit an entire set of new coke-chambers. The dischargers were likewise in bad condition; and these also were renewed, except the seal plates, which were to some extent protected by water.

It was very easy to understand the cause of the damaged iron-

work at the bottom of the retorts. The attendant in charge of the plant was neglectful in keeping sufficient water running into the water-sealed lutes of the discharger; consequently these became dry, and air being drawn into the retort, the coke-chamber was converted into a temporary gas-producer. The result was bad gas and burned hopper plates. One coke hopper and discharger was so badly burned that it fell away before the fitters had time to take it down. Strangely enough, there was one retort in good condition; and after receiving a point-up it has given good service for the past two years. The reason why the retort was found in this state was the fact that it had been standing idle for some considerable time. The coke-hopper plates had become bad, which made the retort unworkable, and in this way escaped the effect of explosion which the others received.

The question then arose as to the possibility of maintaining a regular gas supply during the period of reconstruction. Although there was a complete plant of horizontal retorts available, on considering the time it would take to heat-up these settings, the fuel required, and the labour we had at our disposal (which was mostly composed of women), it was decided to carry-on with the vertical plant.

Details of the Reconstruction.

Fortunately the builders of the plant were able to assist us with skilled labour; and a start was made with the retorts which were in the most crippled condition. As already stated, No. 7 retort was in good condition, with the exception of the bottom coke-chamber and discharger. These were put right by the fitting of new plates. Nos. 5 and 3 retorts were taken down 15 ft. and 18 ft. respectively, and reset. No. 1 required to be taken down a distance of 19 ft. and reset. Opportunity was taken during the reset to substitute silica brick for fire-clay brick in the combustion travels. At the same time, the whiff walls dividing the flame travels were strengthened; thus giving greater strength to the retort wall and prevent bulging. The furnaces of these two settings were gutted-out and relined, arches keyed-up, new charging doors put in, and otherwise made good.

It was next thought advisable to examine the regenerators. These were found to be somewhat leaky; but beyond pointing-up the joints they received no other repair.

During the resetting of the brickwork, all faulty ironwork at the bottom of the retorts was taken out, replaced by new material, and made good. This, then, completed the repair of the first half of the plant. Nos. 7 and 5 retorts, having been already under heat, were producing gas before Nos. 3 and 1 were finished. In this way the time required for drying the new brickwork was considerably reduced; so that after the top mouthpieces were set in their place, the heating-up was increased for 10 to 14 days.

We were now in a comparatively safe position to meet all requirements as to gas supply. Nos. 2 and 4 retorts were taken down to 19 ft., and reset in the same way as the others. This completed the repairs for the time being. The time taken to carry out these repairs was four-and-a-half months; the work being commenced about the middle of July, 1918, and finished by the end of November.

During the early part of this year, the last two retorts (Nos. 6 and 8) were taken down a distance of 21 ft., and reset. The regenerator of this unit was taken out and reset also, as it was found, after examination, that the secondary air tubes were mostly cracked and leaking. A step-grate furnace was introduced at the same time. I also considered it advisable to introduce an additional supply of secondary air about half-way down the combustion flues; so that it is now possible to carry the higher temperature further down the retort, to gasify more completely the steam entering at the bottom of the retort, and also to effect a saving in fuel by more complete combustion of the producer gases at the bottom of the combustion flues.

Faults in the Ayr Plant.

Though the plant is now in fairly good working order and giving results equal to those obtained from plants of a similar design, yet there are faults in the construction which, if more generous consideration had been given to the laying-out of the plant would have saved a considerable amount of labour and expense, and also a saving in the quantity of fuel consumed. It might be well to explain what these faults are. The first of importance is the capacity of the retorts. As already stated, these have a throughput of 5 tons, and a make of 50,000 c.ft. per day; the average make during last year being 65,000 to 70,000 c.ft. when steaming, with a reduced throughput.

Our maximum output during winter is 300,000 c.ft., and the minimum during summer is 180,000 c.ft.; so that it will be seen that the unit is out of all proportion to the output. From experience I have had with a plant of smaller unit, I consider a retort having a throughput capacity of 3 tons per day is more suitable for a medium-sized works such as Ayr. It is not unusual to take-off and put-on a retort twice within seven days. This sort of treatment is bad for any retort, owing to the constant rise and fall of temperature in the retorts. Consequently the working life of the retort is shortened considerably, and there is also a higher consumption of fuel than would be the case on a plant of a more convenient size.

The next question of importance is the chimney pull. It is a well-known fact to engineers who have experience in the working of vertical retorts that, in order to obtain good heats, it is necessary to have an effective chimney pull on the settings. Failing this there can only be worry and trouble to those responsible for good results. This, then, is where the Ayr plant failed. It was thought the existing chimney would be capable of taking the additional burden; but, after a year's working, it was decided to erect a separate stack for the vertical retorts. This chimney was an after-consideration, and not included in the original scheme. Had the new stack been put down in a more convenient position, and of a size proportionate to its work, all would have been well. It is capable of taking the waste gases from eight settings such as we have; but when it is considered there are only two settings working constantly, and three during two months of winter, the temperature in the waste-gas flue leading to the chimney is low, running from 600° to 750° Fahr. Consequently the amount of hot waste gas is small in proportion to its capacity; the result being a cold chimney and poor draught.

As the site of our works is practically on the seashore, we are subject to extreme atmospheric conditions owing to the rise and fall of wind pressure, which has a decided effect on the pull of the chimney. It is not unusual during the winter months, when sudden squalls arise, that the pull on the chimney will be increased by as much as 8-10ths, which means a maximum pull of 15-10ths or more. These conditions might be considered very dangerous, and cause overheating. This is not the case, but it rather produces a cooling effect on the settings, due to the fact that the regulation is set for a low chimney pull. Consequently all damper tiles are full open except for the primary-air slides; these being set to the requirements of the producer. The average normal pull is 6-10ths to 7-10ths, which is not sufficient for good working conditions. A pull of 8-10ths to 10-10ths gives good results and improved regulation. I have seen the increase on the chimney draught to the extent of 1-10th make all the difference between good and bad working heats.

Working under such conditions, the thought occurs whether it would be advisable to consider mechanically induced draught. Certainly the problem has many attractions, and might be worth serious consideration. It would to some extent eliminate large brick stacks. There would be more complete control of the settings, which would admit of a finer adjustment of the heating gases and increased temperature, which is most necessary for the production of good blue water gas in vertical retorts. Also there would be the opportunity to utilize the heat from the waste gases for superheating purposes and producing power, as there would be no longer any need for high temperature chimneys to promote draught. It would I think be found that the first cost of installing and running induced draught would be more than returned by the saving effected in the boiler-house by superheating the steam required for gas making and other purposes.

Regarding the coal and coke handling plant, as already stated, this part of the plant consists of a steam-driven hoist and engine without duplicate; and when it is considered that the capacity of the overhead storage hoppers is barely equal to twenty-four hours' normal working, the margin of safety from breakdown is very low. Breakdowns have occurred on this hoist with very serious results, which meant that all coal and coke required to keep the plant running had to be man handled by a considerable number of men; this amount of labour not being always available in a medium sized works.

Though provision had been made in the retort-house steel work to support a "D.B." conveyor, this has not been put in. The reason why a conveyor and breaker was not erected in the first instance was because it increased the first cost of the plant. This, in my opinion, is false economy, because it will be found that the labour saved in breaking and elevating coal will cover the first cost of this most essential part of the plant. I hold there should be duplicate elevating plant on all retort installations designed to carbonize more than 20 tons of coal per day.

Our present costs for breaking and elevating coal amount to over £300 per annum. While this sum would not cover the present cost of a coal breaker and conveyor, yet had these two items been included in the original scheme, they would have amply repaid themselves to-day. At the best, a rope-lift is not to be compared with either a conveyor or elevator for elevating coal and coke. Should the output of gas increase at the same rate per annum as it has done during the past year, and the prospects being good, we will require to erect coal breaking and conveying plant irrespective of cost, as it is most essential there should be stand-by machinery in the event of a breakdown.

All power required for the installation is supplied from steam-engines. Had I had the erection of the plant, there would not have been a single steam-engine included in the contract. I have complete faith in gas-engine power; and those responsible for the economical working of gas-works, would do well to discard steam-engines where possible. From my own experience, the cost of running gas-engines is less than for steam; and they can be run without a stop for fairly long periods. In my last works, I have run a stand-by gas-driven exhauster for a month on end, without having to worry about its liability to stop. As a matter of fact, I have run a gas-engine for eight weeks without a stop—not because I required to do so, but simply to prove that such a thing could be done. On interviewing a possible consumer on the advisability of installing a gas-engine to generate electric light, I was asked a simple question, "Do you use gas-engine power in your own works?" Unfortunately, I had to admit that we did not. This was a bad admission for any gas engineer to make, and showed a want of confidence in the usefulness of gas as a motive power.

To sum up the whole question of power required in gas-works, it will be found that, with the exception of the exhauster-house, also the scrubbing plant and the few pumps required, all other power should be derived from the principal product of coal (gas). There would be no need to maintain wasteful steam pipe-lines; there would be less stand-by losses; and, consequently, a considerable saving of fuel in the boiler house.

Such, then, are the principal faults of the Ayr plant; but with the exception of the coal-handling gear, the cure for all its evils is work. Had we a more increasing demand on our output, this would enable us to make full use of retorts that are lying idle under heat, and there would be better all-round working of the plant. Although the output has increased by almost 20 p.ct. in the past two years, it would require another 20 p.ct. on this figure to keep two settings working up to their capacity, with the result that there would be a larger volume of hot waste gas passing through the chimney, increasing its pull on the settings, and maintaining a higher working temperature on the retorts, with an all-round increased make of gas and residuals, also a saving on the consumption of fuel per ton of coal carbonized.

STEAMING.

In common with other works equipped with vertical retorts, we use the steaming process. The steam pressure is maintained at 40 lbs. per sq. in. on the supply pipe behind the reducing nipple, which has an orifice $\frac{1}{16}$ in. diameter. The pressure of the steam after leaving the reducing nipple is lowered to almost retort pressure at the bottom of the retort. The usual practice is to work with one-half-tenth pressure at the gas off-take pipe on the top of the setting. During my first examination of the retort brickwork, I was struck with the condition of the brick surface at the bottom of the retort. It was very much pitted and friable. I put this down to the action of highly saturated steam. To counteract this pitting effect, I am now installing a Ferguson superheater to superheat the steam before entering the retort. Unfortunately, I am not in a position to state what effect superheated steam will have on the make of gas per ton, as this apparatus has not as yet come to hand.

As a guide to the results obtained from the plant, I have made out a statement showing the figures contained in our quarterly report ended July 31:

Coal carbonized	903 tons
Gas produced	14,8000,000 c.ft.
Coke produced for sale	278 tons
Tar produced	20,400 gallons.
Sulphate produced	14½ tons

	Straight Coal Gas.	
Gas made per ton of coal carbonized	16,389 c.ft.	13,224 c.ft.
Coke sold per ton of coal carbonized	6·38 cwt.	8·75 cwt.
Tar produced per ton of coal carbonized	22·48 gallons.	16·5 gallons estimated
Sulphate of ammonia made per ton of coal carbonized.	35·90 lbs.	30 lbs. estimated

Average calorific value of gas	430 B.Th.U.
Average temperature in the combustion flue (top)	1950° Fahr.
Average temperature in the combustion flue (bottom)	1475° Fahr.

Gas Analysis.

	Straight Coal Gas. No Steaming.	Mixed Gas in Holder at Meter House. Steaming.
CO_2	5·4	6·7
HC	3·2	1·6
O_2	0·4	0·8
CO	11·0	12·1
CH_4	25·6	22·0
H_2	40·5	50·4
N_2	13·9	6·4
	100·0	100·0
Net calorific value	451·4	422·1
Gross " "	508·4	478·0

Tar Analysis.

Specific gravity of tar	1·083
Free carbon	0·91 p.ct. by weight.
First distillate, up to 170° C. (338° Fahr.)—	
Water	4·04 p.ct. by weight.
First light oils	2·23 " "
Of specific gravity	0·884
Second distillate, up to 230° C. (446° Fahr.)—	
Second light oils	9·81 p.ct. by weight.
Of specific gravity	0·975
Third distillate, up to 270° C. (518° Fahr.)—	
Creosote oils	10·38 p.ct. by weight.
Of specific gravity	0·999
Fourth distillate, up to 310° C. (590° Fahr.)—	
Anthracene oils	9·20 p.ct. by weight.
Of specific gravity	1·032
Pitch (soft)	62·73 p.ct. by weight.

Coal Analysis.

	Per Cent. Wet Basis.	Dry Basis.
Fixed carbon	48·90	52·74
Volatile matter	33·57	36·21
Ash	10·25	11·05
Moisture	7·28	—
	100·00	100·00

Coke Analysis.

Moisture	10·83
Ash	8·77
Fixed carbon	80·40
	100·00

The special feature about the analysis taken on straight coal gas is the large amount of inerts. This is accounted for by a slight pull kept on the retorts during this test, which shows the admission of furnace gases. The analysis for mixed blue water gas is indicative of the general working of the settings, which shows a want of heat. This is our chief weakness in working. As already mentioned, it is only by favourable atmospheric conditions that we can obtain anything like a good carbonizing temperature.

Regarding the production of blue water gas in vertical retorts, this process can be carried out to almost any extent irrespective of the quality of the gas. It is generally conceded by those who have experience in high yields of mixed gas that there is also a high percentage of inerts in the finished gas, and more especially with the quantity of CO_2. There are two points which, in my opinion, have a direct bearing on the amount of CO_2 in the finished gas; and the most important is temperature. If it were possible to increase the temperature in the vertical retort to something like the heat obtained in a good water-gas generator, then it would be quite reasonable to expect a limit to the quantity of carbon dioxide; but as vertical retorts are constructed to-day, it would be disastrous to attempt to work with high temperatures such as that obtained in a separate water gas generator.

A STEAM CONTROLLER WANTED.

The next item of importance is the quantity and temperature of the steam passing into the retort. It is common practice for steam to be constantly blowing into a retort irrespective, of its heat. I am of the opinion that steam used for the production of water gas ought to be superheated as high as possible; and to my mind a steam-meter fixed to the supply pipe leading to the retorts would be a very convenient piece of apparatus. It would then be quite an easy matter to work out the quantity of steam used per ton of coal carbonized. What is wanted is a simple arrangement whereby the quantity of steam can be controlled according to the working conditions of the retorts. I am hopeful of some such apparatus coming on the market; and when it does, we will have taken a step in the right direction in the manufacture of water gas in vertical retorts.

THE STAIR BUGBEAR IN SMALL AND MEDIUM-SIZED PLANTS.

There is one other point I should like to mention in regard to vertical retorts; and this applies only to small and medium-sized plants. It will be found that, on all plants working on the continuous principle, there are three flights of stairs, rising to 40 ft. vertical, by which the attendant requires to climb to operate the retorts. It is usual in small and medium-sized works for one man to be responsible for all the top and bottom work attached to the plant; so that it is not uncommon for the operator to climb these stairs at least once every hour, and sometimes oftener, and by the end of his eight hours he is rather tired of stair climbing. I know what it is, as I did it for a whole night. It is quite true to say that there is a lift by which the attendant can travel. But in most cases operators have a rooted objection to start-up an engine (whether it be steam or gas) to work the lift for his own use; and as there is always continuous running power with continuous verticals, it would be a simple matter to erect a small one-man lift driven from the extractor shift. In this way the attendant could pass from top to bottom with ease. The cost would not be heavy, and it would be beneficial to the plant. I am certain the retorts would receive attention when they are otherwise neglected. I give this suggestion to any builder of vertical retorts who may care to take it up.

CONCLUSION.

In conclusion, it has to be borne in mind that the real cause of the plant's first troubles was due to an earnest desire to reduce first cost; and this seems to have been the predominant feature in the erection of the installation. Had the original scheme been adopted in all its detail, there would have been included the chimney, which would have been built in a more convenient position, and of a size in proportion to the number of settings. There would also have been included the coal and coke elevating plant; and the result would have been better regulation on the settings, improved results, less costly labour in breaking and elevating coal, coal of more uniform size for carbonization, and a better all-round efficiency. Therefore, it will be seen that in the erection of such important installations as vertical retorts, the first cost is sometimes quite a secondary consideration. The first cost is the basis of all important schemes; but it is bad policy to cut out such important items as have been stated, in order to save a few hundred pounds on a scheme that is costing as many thousands.

DISCUSSION.

The PRESIDENT (Mr. R. W. Cowie, of Port Glasgow) said they had had a most interesting paper from Mr. Harper, and one which should provoke a good discussion. There were now in Scotland a number of works where vertical retorts had been in operation for some years, while there were also a considerable number of works where vertical retorts of one kind or another were being installed. Thus, then, those among the members who had been working with vertical retorts

for some years would be able to say something as to their experience of the settings, which those meanwhile installing verticals would be glad to hear. There were a few points in the paper which interested him in respect that these showed the differences between the plants at Ayr and Port Glasgow. At the latter place there was no primary-air slide whatever. Indeed, he was rather surprised to know that there was not even a board on the bottom of the producer. He believed that the method of regulation found best was that by means of the damp course. There was no question that the author had considerable difficulties to contend with in Ayr; and these had arisen to some extent in consequence of the fact that the plant had been put down in the cheapest manner possible. This, as the author had himself pointed out, had proved to be mistaken economy. At Port Glasgow they were entering into the enterprise most whole-heartedly; and so far as they knew they were endeavouring to get everything of the latest and the best. Regarding the coal and coke handling plant, he might explain that at Port Glasgow they had both a hoist and a conveyor to deal with the coke and coal; so that if one happened to break down the other was there to meet the emergency. Then at Port Glasgow they had installed an electric lift, and in this way had removed the difficulty and inconvenience of a workman having frequently to run up and down the stairs. As a matter of fact, until he heard the paper read he had not definite knowledge that it was necessary for an attendant to go up and down stairs so often.

Mr. JAMES DICKSON (Johnstone) said that at Johnstone he might explain that they drove their fan at such a rate that they got 10-10ths pull at the fan itself and 9-10ths at the end of the bench. Generally, however, he should say that the author was quite right in what he said about draught. After the minor initial difficulties were overcome at Johnstone, they found themselves sailing into much smoother waters. With what the author said about coal and coke handling plant he entirely agreed. He was a believer in showing a storage capacity of forty-eight hours for coal. This enabled a supply to be laid in on a Saturday; and the necessity of elevating more until the Monday morning was removed. Mr. Harper said that the cure for all the evils and faults in the larger plant was work; and it was interesting to recall that one of the greatest of Scottish writers advised work as the cure for all troubles. In reasoning along these lines, the author had struck a very high note indeed. Personally he could not speak about the effect of superheated steam, but he could say something in relation to the effect of waste steam on the bottom of the retorts. He had experience recently in looking at the bottom of the retorts; and he found little effect had taked place on the last half-dozen courses. If anything, there was a sign of friability and a slight breaking of the skin; but there was nothing at all disconcerting. As to coal carbonized, the analyses were instructive. He did not know whether Mr. Harper considered the best was being got out of his plant; but he was inclined to say that pretty good average conditions were being obtained. Lately they had heard a good deal about multipliers; but he considered the author was nearer the truth than a lot of the stories they found recorded in the technical press. Statements were there to be found about makes of 13, 14, and 15 million cubic feet per ton of coal carbonized. This much he (Mr. Dickson) could say, that the best average results in the finest and best-equipped works in the country ran out about 8 to 9 millions. Candidly, he felt that the gas engineer who was striving for more than 9 millions was laying himself out for trouble. It was interesting to find that the author stated that the carbonic acid content was 5·4. This he believed would be difficult to beat; and this was just one of the points they would require to watch very carefully in the future. They must so regulate their heats as to ensure that the content of carbonic acid was brought down as far as possible. Frankly, he had rather the impression that in many previous cases the carbonic acid content had been somewhat understated. He did not suggest in the slightest that the author's figure was understated; but he put it to him—could he give any guarantee that, week in week out, with varying heats, varying conditions of steam, labour, and so on, the figure of carbonic acid content could be continued? If he could give such a guarantee, then he was not far from getting the best the plant at Ayr was capable of accomplishing. In the olden days, it was found that sometimes they got 5 p.ct. of CO_2 at the outlet of the condensers with Scotch coal—leaving out of the question cannel coal and all those other things now forgotten. To-day they were purifying with oxide of iron and still getting the CO_2 content pretty high. They were not removing it altogether by means of washing; and it was being added to by the fact that steam was going in through the coke that was being raised to the necessary temperature for conversion. Altogether he should say that 5 p.ct. as a future content would be good average working; but let them all strive to bring it below even this figure.

Mr. J. J. SCOTT (Cowdenbeath) said that for the past ten or twelve years they had been pretty well spoon-fed with all the good points of vertical retort installations. To-day, and in fact during the past two or three years, inquiries had been made into the comparative merits of vertical and horizontal retorts. It had been rather interesting that day to listen to the paper which illustrated what might happen to a vertical retort setting. The position appeared to be that such questions as saving on the initial cost, bad labour conditions, and so on, did materially affect the retort-bench as a whole. He always felt that vertical retorts should be viewed in that light, just as the horizontal bench had been treated the past decade or so. Indeed, he questioned if, on these assumptions and inquiring minutely into the circumstances he had enumerated, the best vertical installation to-day would compare favourably in every respect with a modern and up-to-date horizontal setting. It seemed to him that the whole question with the verticals was that they put their money on cast iron and brickwork; while in regard to horizontals their money was put on labour.

Mr. DAVID VASS (Perth) considered the plant at Ayr did not get a fair trial under fair working conditions; and if a horizontal setting had been treated in the same way, it would have been level with the ground long before. Mr. Harper had courage not only to face the difficulty, but to tell them how he did so. At Ayr, the whole brickwork had shrunk very much from the ironwork; and this, surely, was evidence that there had been a somewhat serious shrinkage and displacement of brickwork. The state of matters at Ayr was such that it was impossible to get results. He merely made these remarks with a view to showing that it was not altogether a set of circumstances that was likely to happen in vertical retorts in a general way. Mr. Harper had to deal with a very exceptional set of circumstances; and he had dealt with them most manfully.

Mr. ROBERT SIMPSON (Cambuslang) said that, as the second gas manager in Scotland to introduce vertical retorts into his works, he should like to congratulate the author on the practical character of his paper. He had been working with a Glover-West vertical installation for fully eight years now; and, although the verticals at Cambuslang were in their eighth year, they were as good to-day as when they were built. There was not a solitary fracture to be seen there—either inside or outside. Adverting to the observations made by Mr. Scott, he could not conceive how anyone considering the installation of a new bench of retorts to-day would for one moment hesitate to introduce a vertical system. Viewed from the standpoint of economy all round or in regard to the outlays in respect of repairs and maintenance, vertical retorts were to be preferred to horizontals. One other point occurred to him, and it was that those contemplating making water gas with verticals must learn to keep-up the heat. With regard to chimney draught, he did not approve of having a chimney on the ground floor of a vertical installation. His own view was that the chimney should be on the top of the bench. Only from the top of the bench would they get a natural draught, and the draught capable of giving the heat. Mechanical help in improving the draught on the ground level might be quite good; but it was not natural.

Mr. DAVID FULTON (Helensburgh) said the President had referred to the fact that during the past three months they been carrying through some repairs at Helensburgh to the vertical retort installation erected there in 1911. In the early part of last year, after a pretty severe winter's work, it was discovered that perhaps not so much the condition of the retorts themselves as the state of the flues necessitated that something should be done. The amount of short-circuiting through the party walls was causing them the expenditure of very much more coal than was necessary. He, therefore, considered it would pay them in the long run to rebuild the retorts from the bottom with silica. This work was carried through and completed in February last. Incidentally, he might explain also that they had a slight explosion in one of the beds which rather destroyed the party wall. However, he did not think they could grudge this renewal very much after having the plant for eight years without having expended any money whatever on retort repairs. The lowest period that any one of these beds was continuously working was 1600 days, while another bed had been at work almost 2000 days. Mention of these statistics brought to his mind a tendency on the part of those having vertical retorts to enter into competition with a view to determining whose beds should work the longest. This was a tendency which was to be deplored. There was a possible danger that the plant would be continued at work beyond the period that it was economically capable of working. To his mind, it was a very much better policy to go in for renewals and to start afresh. The retorts were first built with fire-clay; and it served them so well that he was reluctant to put in the silica top which was now the fashion. In regard to the wear of the retorts, one matter sometimes lost sight of was the fact that all the works were not using the same fuel. Some were using nothing but nuts; others were using some nuts, some round coal, and even mere dross. The works that relied on nuts were bound to find that their retorts lasted longer than those using the mixtures of various kinds of round coal. So far as steaming was concerned, he had been struck with Mr. Harper's figures. The CO_2 content in straight coal gas, where there was no steaming, was 5·4 p.ct.; while in the instance where there had been steaming, there was an increase of 1·3 p.ct. He should rather have thought that the increase of CO_2 would have accompanied any increase in nitrogen; but the analyses did not reveal this. It seemed to him that blowing in steam at a pressure of 40 lbs. per sq. in., and with the temperature steady, there must be a great deal of steam passing through the author's retorts which had no effect whatever. Going through a number of works, he had noticed the different pressures at which steam was admitted; and it had struck him that it would be rather interesting to ascertain how much steam was really used up uselessly in the retorts. During the last financial year the percentage of unaccounted-for gas in his district increased considerably; and he took the opportunity of discussing the situation with some of his friends. One explanation offered was that the steam which left the retorts as steam was held-up in mechanical suspension, and was not readily condensed until it reached the mains. In this way it was explained the unaccounted-for gas became greater. Whether this was a good theory or not, he could not say. He (Mr. Fulton) had been impressed with the author's pointed references to the saving on capital cost; but such a desire for economy on the part of councillors and boards of directors was not, after all, to be wondered at. In the old days—say, ten years ago—councillors and directors were accustomed to the usual annual charge for rebuilding some retorts—a charge which probably amounted to about £500 a year. Suddenly faced with an expenditure of £10,000 on a vertical retort installation, it was not to be wondered at that council and boards should become somewhat careful and even cheeseparing.

Mr. H. FRAZER (Dalmarnock) thought that the information they had elicited from Mr. Harper in the course of his paper led them to the conclusion that the failure of the plant was particularly due to the want of efficient labour at the works. Many works had suffered in much the same way during the war; and the popular idea that women might be found suitable had been somewhat disproved by later experience. He quite understood the argument of Mr. Harper that inefficient labour had been the origin of all the trouble at Ayr. Experience had shown that they must really have efficient labour at the retorts. So far as the chimney pull was concerned, he was in agreement with what Mr. Simpson had said. It was really a foolish thing to erect a large chimney (say) 120 ft. high. It seemed to him that, under such conditions as he could visualize, they would be losing about two-thirds of the value of the chimney. He was pleased to hear the comments of Mr. Dickson in regard to chimney draught. He was in sympathy with his remark that he would never think of doing mechanically that which Nature could do for him. In Dalmarnock they had four benches, equal to a make of 2½ million cubic feet, going into one

chimney. At the outset, they were doubtful whether the chimney would take four benches or not. Personally, he had no doubt whatever on the point, with the result that their former chief in Glasgow (Mr. Wilson) agreed that they should put up four benches, and that there should be a single chimney. The results from this arrangement had been wonderful. In connection with one matter mentioned in the paper—a hoist for workmen—he would like to say a word or two. Most of them who had anything to do with vertical retorts knew that each operator had a certain amount of work to do at the bottom, and also a certain amount at the top. At Dalmarnock, he introduced an arrangement by which the man at the bottom remained there, and the man at the top kept to the top. Experience had shown the arrangement to be better for the men as well as for the work. In ordinary circumstances, a man had to mount these stairs eight times in the course of a shift; and this in itself was quite sufficient work to do without any manual labour at all.

Mr. HARPER, replying to the points raised in the discussion, said he was convinced that there were a great many people making blue water gas who did not know the kind of gas they were manufacturing. It was as the result of investigation that he began to think seriously of the position of his gas. On the point raised by Mr. Dickson, relative to the CO_2, he was convinced there were a good many factors which affected this. For instance, such points as excessive steaming, want of heat, lower temperature, &c., all had their effect. He was convinced himself now from experience that high-temperature steaming was absolutely necessary. The old controversy as to the comparative merits of horizontal and vertical retorts had been raised by Mr. Scott. The whole subject was one which had to be considered in the light of local conditions. Each individual case had to be dealt with on its merits; but on the general question, he would say that vertical retorts could give horizontals something both in the way of gas production and labour. Managers who were faced with the possibility of introducing vertical retorts would do well to consider the relative merits of verticals and horizontals seriously; and, if they did so, the conclusion arrived at would be that the balance of accumulated evidence was in favour of vertical retorts. He thanked Mr. Vass for the observations he had made in regard to the Ayr plant. The plant was giving good results there to-day, despite the fact that there were certain weaknesses as he had explained. These weaknesses he felt bound to say would disappear with increased work. In the course of the discussion, Mr. Simpson raised the question of the chimney. He might explain that this was a secondary chimney, and out of all proportion to the duty required of it. Regarding the mechanical drive, there was a lot to be said in favour of this. In most boiler-houses to-day they saw evidences of mechanical drive. Then, of course, there was the question as to saving-up the heat in the waste gases. Very strongly he held to the view that one could get a better efficiency out of the waste gases by having a mechanically-induced drive than with a chimney.

The discussion was at this point closed, and a cordial vote of thanks passed to Mr. Harper on the call of the President.

The Haber Discoveries in France.

According to a recent issue of the "Frankfurter Zeitung," France, at the present time, apart from her efforts in connection with the Treaty of Versailles, is desirous of obtaining the patents of the Haber process owned by the Badische Anilin und Soda Fabrik. The French Government has, as agreed, already been allowed to take over the patents registered in France; but on Nov. 11 last year it entered into private negotiations with the Badische Company in connection with the acquisition of the Haber process, and the completed agreement is now awaiting ratification by the French Senate. The French have realized that the Claude process is not altogether satisfactory, and desire to add small technical details as used in the Haber process, so that these might be put into working at a factory shortly to be erected. The proposal is to convert a powder factory at Toulouse, at present unused; and if no private company is prepared to develop the invention, under the supervision of the State, the State will do so on its own account. It is hoped eventually to manufacture in sufficient quantities to cover both military and agricultural requirements, and so make France independent of other countries with regard to her supplies of ammonia.

Extracting Gasolene with Charcoal.

Dealing with the results of some experiments made by them in connection with the charcoal absorption process for extracting gasolene from natural gas, Messrs. Burrell, Oberfell, and Voress say that they operated, for comparison, a charcoal plant on the same gas on which the United Natural Gas Company had already installed and worked an oil-absorption plant. The latter plant was built three years ago, and produces 2000 gallons of gasolene per day, or from 125 to 130 gallons per million c.ft. of gas treated. Of this production, from 20 to 30 gallons per million c.ft. "weathers" away before shipment. By a long series of tests, the investigators assured themselves that gasolene from the charcoal plant has about 3 lbs. lower vapour pressure, and requires less naphtha for blending. The charcoal plant produces 50 p.ct. more gasolene from the same gas, and has fewer units and less costly machinery. At the same time, it occupies less space, and operates without the necessity for highly compressed gas. The waste occasioned by the loss of oil in the oil system is not really paralleled by the loss of absorbent in the charcoal system; while the charcoal plant is simpler to operate, and cheaper to instal.

Mr. Thomas Brown, the Managing-Director of the West Norfolk Farmers' Manure and Chemical Company, Ltd., who died recently, aged 82, left estate of the gross value of £22,904.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Thermal Efficiency—A Personal Note.

SIR,—A letter in your last issue from Mr. H. E. Jones alludes to the bet and challenge of Mr. Helps taken up by me at the meeting of the Manchester District Institution of Gas Engineers on the 25th of October, 1918, as "most amusing." Whatever may have been the effect upon others, will you permit me to say this incident to me personally was not amusing, but on the contrary an exceedingly unpleasant affair.

I was roused to resentment at the meeting by the stupid attempt of Mr. Helps to hoodwink his compeers, for what was obviously his own personal gain; and in my resentment I transgressed the canons of an honourable Institution, which to me has always been a matter of extreme regret.

The statement upon which the difference between us arose was as follows: "Let them go into any house they liked, and take the appliances in use there, and test them and see if they could not boil a quart of water in the same time and with the same quantity of gas, whether the gas was 350 or 500 B.Th.U. He was prepared to bet anyone in the room a hundred guineas that it was so." [See "JOURNAL" for Nov. 5, 1918, p. 306.]

As Mr. Helps has made no public withdrawal of his absurd claim, the matter between us remains open; and neither Mr. Helps himself nor anyone on his behalf is going to cry the incident off on the score of it being a joke.

Mr. Jones designates Mr. Helps a doughty champion of the industry. Personally, I hold a very different opinion, and would add that notwithstanding all the talk and writing, I know of nothing in the rediscoveries that have emanated from Nuneaton that has advanced the industry in the slightest degree.

ISAAC CARR.

Widnes, Sept. 3, 1920.

"The Three Tailors of Tooley Street."

SIR,—While I was aware (like the "Nation of England" in the historic representation I have referred to) the British Association had approached the Board of Trade by the medium of the gentry mentioned in your issue of the 1st inst., I had no idea they had been concerned in an inspection of the gas-fittings of the East of London.

I should most probably have questioned their competence to judge in either case, as I do not know them in gas affairs, and still less in brass-finishing. But as having been concerned for the past fifty years with gas supply in East London, I can reassure your readers as to the quality of both the gas and the fittings, which are excellent, and above all economically cheap to the users.

The "deputation" gentry might like to know that the gas containing moderate but persistent inerts (which cannot be eliminated) is used on an enormous scale in the reduction of nickel, gold, and other refractory metals by the Royal Mint and by the extensive refineries of the Rothschilds, gives full satisfaction, causes no complaints, and is sold at the lowest price in London. The fittings supplied to the industrial residents almost exclusively by the Commercial Gas Company, which relatively supplies by far the largest proportion of them to the general consumers in the kingdom, are the best of their kind bought from firms of the highest class for many years past. This Company wisely were pioneers in the slot-meter supply which is exclusively adopted by working-class populations.

I can make great allowance for scientists on the prowl; but really they should inform themselves as to material facts before they go deputizing, reporting, or lecturing. Of course, like the man who stole the horse, "man must live." But like the judge in the case, I do not see the necessity——at my expense.

However, "Sweet are the uses of *advertisement*," as Mark Twain said; so I must be resigned.

HY. E. JONES.

Ongar, Essex, Sept. 5, 1920.

To Fight Syndicalism.

SIR,—Will the miners strike? This is the question of the moment; the answer really lies with the public.

As long as the gentle syndicalist and extremist sees that the public is afraid or neglectful, and that he can try on with impunity all kinds of tricks so as to increase the burden on John Citizen, we may expect trouble. Something more than a middle-class league on its present lines of action is wanted to secure any just consideration for that overburdened section of the nation. To make it a practical power, it needs to develop a system of co-operation between employers and a volunteer industrial army which could checkmate these evil schemes to wreck national interests.

There are vast numbers available for volunteer work on an emergency—men and women who are quite independent of all political labour organizations. The recent railway strike brought out useful indications of this. The safety of the country now calls for its proper organization, so as to be immediately and effectively turned on when the emergency arises.

There are thousands in offices and shops who could be temporarily spared during times of crisis, and who could with a slight amount of training in their spare time undertake such duties as supplementary men available for working pumping engines at the collieries, or undertake duty at the local gas and electric works, so as to prevent towns being suddenly plunged in darkness.

With regard to transport, the motor part is now pretty well in hand; but the amateur bargee deserves a thought. To handle a couple of barges is quite a suitable job for two or three volunteer workers provided one of them has had a little previous initiation. It also admits of men of congenial habits and status being placed together.

A young man who is doing any mechanical work—such, for instance,

as an ironmonger's apprentice—would very soon pick up the working and superintendence of a coal-cutting machine.

Many of the more steady and experienced workmen are sick of the tyrannical restrictions and bad economic policies of the trades unions, and would be glad to be free if they could.

When strikes are over issues between employers and employed in special trades, outsiders naturally prefer to leave them alone to adjust their own affairs; but these modern extremist moves are of a quite different nature.

The colliers have for years been very highly paid. Compare the remuneration of a young professional man, who has had an expensive education to qualify him for his work, and the colliery wages; also compare the way a professional man with £5 or £6 a week spends his money and the way a collier making the same amount does. Which devotes the largest proportion to gambling and self-indulgence?

The way thoughtless boys have been allowed full voting power on so serious an issue shows how the Miners' Union is managed.

We are still suffering from the shallow greed which dictated the railway strike. The leaders of this, instead of striving to obtain conditions under which men could live comfortably on their wages, have by their narrow selfishness made living more expensive for everybody and benefited no one.

Let the extremists learn that the game of threatening direct action against the country has its dangers, and is not an easy and profitable amusement. Then we shall soon see the end of it, and take prompt measures to do without him.

With regard to the empty-headed boys who have been voting for the strike, it is to be hoped the colliery officials will go to the schoolmasters and give these jobs to the most respectable and well-recommended boys just leaving the schools. Such a course would make for future peace, as well as helping present difficulties.

F. J.

Sept. 4, 1920.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Sept. 1.]

Nos. 24,381—24,949.

BARRACLOUGH, A.—"Gas-heated washing boilers." No. 24,795.
BENNETT, W.—"Mechanically-operated grates for gas-producers and furnaces." No. 24,892.
BRADBURY, H. W.—"Inverted gas-mantle holder." No. 24,513.
CAMPBELL, A. C. & K.—"Swivel joint for pipes." No. 24,643.
CANADIAN-AMERICAN FINANCE AND TRADING COMPANY.—"Hydrogenating bituminous substances." No. 24,480.
CANADIAN-AMERICAN FINANCE AND TRADING COMPANY.—"Distillation process." No. 24,481.
CANADIAN-AMERICAN FINANCE AND TRADING COMPANY.—"Mechanism for diffusing gases and vapours through liquids." No. 24,482.
COLE, R. C.—"Gas, &c., burners." No. 24,791.
CONNER, F. G.—"Appliance for heating boilers with gas." No. 24,385.
ERLER, K.—"Burners for gas-stoves." No. 24,680.
GRAAFF, C.—"Gas-operated fire-extinguisher." No. 24,477.
GROVES, C. D.—See Bradbury. No. 24,513.
HUTCHINGS, R.—"Incandescent gas-mantle box." No. 24,700.
JARVIS, E. H.—See Bradbury. No. 24,513.
KLINGENBERG, G.—"Filter for separating impurities from gas." No. 24 873.
MOLLER, A. C.—See Conner. No. 24,385.
MORTON, H. & J.—"Gas fired kilns." No. 24,890.
NOEF, E. E.—"Recovery of sulphur from sulphuretted hydrogen and ammonium sulphide and gases containing such." No. 24,387.
O'DELL, A. E.—See Canadian-American Finance and Trading Company. Nos. 24,480, 24,481, 24,482.
PARR, C. E.—"Process for desulphurizing carbonaceous material." No. 24,432.
PEARSON, R.—See Parr. No. 24,432.
SCHWORETZKY, G.—See Graaff. No. 24,477.
SHAW, H. S. HELE.—"Pipe-joints." No. 24,862.
SOUTH METROPOLITAN GAS COMPANY.—"Plug-cocks." No. 24,450.
TAYLOR, G.—"Gas-cooking ovens." No. 24,891.
THIELE, P.—"Stop valves for stand-pipes of coke and distilling ovens." No. 24,536.
TRIBE, E.—See Shaw. No. 24,852.
TYLER, W. F.—"Recording liquid meters." No. 24,872.
WERLE, N.—See Graaff. No. 24,477.

Perth Gas-Works Results.—The past year has been a prosperous one for the Perth Corporation gas undertaking. There was a large increase in the consumption of gas; while the revenue exceeded the estimate by £8128, attributable to a considerable extent to the high return obtained from residuals, which was £4089 in excess of the estimate. A balance of £1241 was carried forward.

Woking District Gas Company.—At last Monday's meeting of this Company the Board reported that the receipts from the sale of gas showed an increase of 27·57 p.ct. last half year over the corresponding period of 1919; and sales of residual products, an increase of 69·44 p.ct. The revenue was £23,071, and the expenses £20,453, leaving a net profit of £2618, to which was added the balance brought forward—viz., £1604. After making the usual charges for interest, income-tax, &c., and writing-off the discount on redeemable preference stock, there remained an available balance of £3069. As a result of further increases in the cost of coal, labour, &c., the Company had been compelled to increase the price of gas to 6s. 9d. per 1000 c.ft. The Directors have obtained from the Board of Trade an Order under the 1918 Act entitling the Company to pay a dividend of 3½ p.ct. per annum while the price of gas does not exceed 6s. 9d. per 1000 c.ft. This dividend on the "A" and "B" stock and 5 p.ct. on preference stock will absorb £1477, leaving a balance of £1592 to be carried forward.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

In view of the recent Act obtained by the Company, requiring its general meetings to be held annually, the meeting announced for the 11th of August did not take place; and, in these circumstances, the following letter has been addressed to the shareholders.

Important Notice to Shareholders.

Dear Madam or Sir,—I desire to take the opportunity afforded by the transmission of the enclosed dividend warrant to ask your special attention to the following observations.

The dividend is at the same rate as that declared during the preceding six months, and is the maximum allowable under the provisions of the Government Act passed two sessions ago, which was intended to afford relief from the intolerable conditions imposed by previous sliding-scale legislation.

Shareholders in this Company will need no reminder of the inadequacy of that relief, having (between them) suffered loss in dividend of over half-a-million sterling since the outbreak of war, irrespective of the heavy taxation levied on the remainder.

It is not surprising that such conditions have rendered unpopular the investment of capital in gas supply in spite of the encouraging outlook for the future of the industry.

With the object of getting this grave injustice remedied, the Directors promoted a Bill in the recent session of Parliament, and were fortunate in obtaining the highest financial and scientific assistance in the country in support of its provisions.

In this connection, the Board desires to acknowledge its great indebtedness to (among others) Sir William Plender, Sir Harry Goschen, Sir Herbert Hambling, Sir William Pope, Prof. Henry Louis, Dr. E. F. Armstrong, Mr. J. G. Buchanan, Mr. Andrew Young, Mr. Frederick I. Pitman, Mr. Doig Gibb, its leading counsel Mr. Vesey Knox, and last, but not least, its indefatigable Parliamentary Agent, Mr. T. Seager Berry, for the invaluable assistance and support these gentlemen so unreservedly placed at its disposal.

The principles for which they contended were completely vindicated before, and accepted by, Committees of both Houses of Parliament.

The unjust sliding-scale has now disappeared for good from the Company's charter; its place being taken by provisions framed more in accord with present-day conditions. In substitution for an antiquated piece of legislative machinery (the need for which ceased long ago) which has wrought great and cruel injustice upon gas shareholders during the war, Parliament has now adopted the basis that Capital invested in gas supply is as much entitled to a fair return for its use as is Labour for its service therein.

It has fixed that return at 5 p.ct. per annum in respect of the issued, and at 6 p.ct. per annum in respect of the unissued, ordinary stock of the Company, which rates, under all circumstances, the shareholders will henceforth be entitled to divide. Profits earned beyond this will be divisible in the proportion of three-fourths to the gas consumers by way of reduction of price, and one-fourth in equal parts to the shareholders and co-partner employees. Both Capital and Labour will thus be encouraged to progressive effort—the one by extending business in all directions, the other by economical working and production. As a result it is confidently hoped that these bonus additions to, on the one hand, the standard rate of interest on capital, and, on the other, to standard rates of pay for labour, will become quite substantial.

The evaluation of gas according to its illuminating power—towards the supersession of which this Company, at a sacrifice of present advantage, took the first step in 1900—is now abolished, and its place filled by a rational system of selling gas according to its heating value, which will enable the Company in future to produce gaseous energy less wastefully and with more regularity of quality. In this great change the Company has played a not unimportant part.

Its present-day consumers of self-luminous gas will not be prejudiced thereby, as there is no intention of sacrificing their necessities to the luxury production of motor spirit.

Parliament has also again confirmed its earlier recognition of the need to encourage in every way the supply of gas having the highest degree of purity, and in future the attainment of this ideal in the interests of gas consumers will be dealt with as an aspiration legitimate and justly entitled to reward. By the adoption of processes for its complete purification, any foundation for the remaining prejudice expressed by some to the use of gas for all domestic purposes will thus disappear.

With the foregoing adjustments of the conditions under which the Company carries on its business, the Directors feel a heavy burden of anxiety has been removed from the shareholders; and they desire with complete confidence to draw their attention to an important particular in which they will have an opportunity before long of doing their part in building-up the future organization of the Company upon the new foundation which has been provided.

Owing not only to the extension of business, but largely to the need for more floating or working capital entailed by the higher costs of material and labour, it will be necessary to make, at the first favourable opportunity, a substantial issue of capital, and thus replace the temporary loans at present obtained through banking sources.

This necessity, experienced by all industrial undertakings, is one the Directors feel they can with no uncertainty appeal to existing shareholders to meet, and thus to do their part towards the post-war re-establishment of the undertaking in providing a substantial portion, if not the whole, of the new moneys required.

(Signed) CHARLES CARPENTER, Chairman.

Sept. 2, 1920.

LEA BRIDGE DISTRICT GAS COMPANY.

Substantial Increase in Gas Sales.

The Half-Yearly Meeting of the Company was held on Tuesday of last week, at the London Offices, Nos. 63 & 64, Chancery Lane, W.C. —Mr. A. M. PADDON (the Chairman) presiding.

The SECRETARY (Mr. Richard Sandell) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN said the first of the satisfactory series of features in connection with the statement of accounts which the Directors had to present that day was the very important increase in the quantity of gas sold during the six months under review—over 11 p.ct. This, coming upon a sequential order of such increases was, he was sure they would agree, very gratifying. In regard to the capital account, which usually did not attract a great deal of attention at these meetings, it was worth while to note the very large margin of power which remained to the Company with reference to the issue of future capital. It would be seen that the Company had over £208,000 of ordinary stock remaining to be issued, when they might need to do so, and circumstances were sufficiently propitious. They had also nearly £70,000 of debenture capital similarly to put before the public. Now, considering how difficult it was to raise money, and the peculiar qualifications imposed by Parliament in regard to the issue of capital, it was gratifying to think that they should have provided themselves in this way as recently as 1917. Had they done so earlier, they would not have obtained the facilities which they did; and had they attempted to do it later, they would not have got it at all. So they were at least fortunate in the incidence of their last application to Parliament. From the capital account, it would be noticed that the total expenditure amounted to £336,358; and this was equal to about £430 per million cubic feet of gas sold during the past twelve months' operations. This was a very low figure; and it was gratifying to see that it had been reached after an expenditure during the last six months of over £11,000. Of course, the proprietors would be prepared for a considerable expenditure upon the works, when the Directors had to record these continual increases in the dimensions of the business. In the revenue account, he might say, as he had had to say on other occasions this half year, that every item had been increased, with the exception of some insignificant details. But there were two charges in the accounts of an abnormal kind —by which he meant that they did not recur in each successive period of six months. These were the amounts for stamp duty on capital and expenses on the issue of debenture stock. In these respects they had spent nearly £800 which was not a normal revenue charge. On the credit side of the account, sales of gas, together with rental of meters, stoves, and fittings, had brought them £14,833 more than a year ago; and the returns from residuals had increased by the handsome sum of £9260. In the aggregate, the receipts had increased by £24,096, in the expenditure by £24,973, while the profit had fallen by £877. From the profit and loss account, it would be seen that they brought into the account £3916, and were taking forward £3876; so that there was only a nominal difference of £40 in the carry-forward as the result of the half-year's working. But he might say, what the proprietors must have seen for themselves, that this result had only been reached by continent and conservative finance in regard to the accounts.

THE DIVIDEND POSITION.

The figures he had already given of increases in the revenue account in connection with the cost of production would have shown them that, inasmuch as these increases were continuous and progressive, it was necessary to raise the price of gas as from the half year; and it was certain that, for at least two more half years, the proprietors would have to suffer the inadequate dividends which were all the Directors were allowed to give them by the ordinances of Parliament. They would, however, see from these accounts that, if this limitation were removed, and the Directors were allowed to do so, they could very easily earn for the proprietors all that would be necessary to pay them the dividends which they had before the war. The Directors sympathized in the very fullest possible way with the proprietors in the deprivation they had already had to suffer, and the more important deprivation that they would have to suffer for the next twelve months. But the tender mercies of Parliament in the way of finance were never retrospective; and they could not hope until a year from now to obtain any definite and specific relief in this direction from the contemplated policy of the Government. Then matters would, he trusted, materially improve; and the poor, unfortunate, much harassed, and much tried gas proprietor would be restored to something like his former very moderate dividend upon his investment. Even then, when subjected to the heavy taxation of the present time, his position would not be a very gratifying one, as compared with what it was before the war. But the Directors would at least know that the money they could earn for the proprietors would be distributed to them with a wider degree of liberty and margin than obtained now. Turning to the balance-sheet, they would see some encouraging figures. Investments of the reserve, special purposes, and benefit funds, which had been written-down, were to-day of the value of £21,885; and the entries under cash showed that the Company possessed £25,000, of which £20,000 was on deposit. Now, anybody who knew the difficulty and anxiety attaching to the issue of capital in these days would be glad to see that the Company had money lying to their credit at the bank, though, of course, it was largely bespoken for the improvement of the works. The gas, meter, and stove rentals due, together with amounts owing for residuals and sundry accounts, they would find rather more than balanced the sum shown on the other side as due to sundry creditors, which was a satisfactory condition of affairs. Speaking generally, he thought that the balance-sheet was about as healthy a one as would be met with in these days; and it was a great source of confidence to the Board that it should be so.

THE OUTLOOK.

As to the future, which always concerned them more than the present in these troublous times, they none of them knew what significance to attach to this menace of a coal strike. The Directors had made every possible provision to meet this and any other similar disturbances to which they had grown almost accustomed during the past few years, and had taken into stock every ounce of coal they could get. If the strike were to run its ordinary course, uninfluenced by adventitious circumstances (which was never the case), the Company should last longer than the strikers; but these things were not settled on their merits. However, the Board had taken every precaution they could, and had secured the interests of the proprietors as far as it was practicable for any Directors to do. Again, they did not know what might be sprung upon them in the matter of labour during the present six months. One thing became increasingly clear—that through all these troublous times the gas industry had obtained a greater and closer hold upon the public than it ever had before. It was essentially so in their district. From being what he might call a normal commodity, it had become a vital necessity to the poorer people. Therefore they could look forward with considerable confidence to the development of the business in the future. The price of gas from which the figures now submitted were derived averaged only 4s. 4d. per 1000 c.ft., which was much less than was charged by larger and more representative undertakings; and though they had been compelled to increase their price very considerably, they would still compare quite favourably with those who carried on business in corresponding or even better circumstances than themselves. He concluded by moving the adoption of the report and accounts.

The DEPUTY-CHAIRMAN (Mr. G. W. Carey) formally seconded the motion.

Mr. H. F. PARDY said the report that had been presented to them was a most wholesome one. He read his "GAS JOURNAL," with very little knowledge, but with much interest; and he supposed the Directors would take all the dividend they could under the new Act. He would like to know what was the production of gas per ton of coal, which was of very bad quality now. Also, what percentage of carburetted water gas did they make? Then he noticed that the gas prices were less discounts.

The CHAIRMAN replied that, with regard to the new Act, he had told them that the Directors were not going to let any grass grow under their feet in that direction. But for the fact that the Long Vacation was on, they would have already been in consultation with their agents and solicitors. The members of the Board were not destitute of experience in such matters, and so would not be likely to miss anything in this way. As to discounts, he thought it would be found in connection with almost all gas undertakings now that a series of discounts were allowed with regard to the use of gas for power and in abnormal proportions as compared with the ordinary consumer. Without this, it must be realized that one would not get business in these days. It did not cost so much proportionately to collect the money from a man who took a large quantity of gas; and there were other matters that come into consideration. With regard to the make of gas per ton, the Directors did not attach so much importance to this as formerly, because it was necessary to chop and change so constantly in the matter of policy. It was about 12,000 c.ft. If they got any more, it simply meant that they had to draw upon their oil. The time when the make per ton was the governing factor had gone. He could not say what was the percentage of carburetted water gas. It had to be changed from day to day, and even from hour to hour. They were really not masters in their own house, but were what the Government had made them.

The resolution was then put to the meeting, and unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS, dividends were declared, less income-tax, at the rate of 5 p.ct. per annum on the preference stock and 5 p.ct. per annum on the consolidated ordinary stock.

The CHAIRMAN, proposing a vote of thanks to the officers and staff, remarked that he could say nothing in support of it beyond what was shown in the accounts. It was a very excellent statement—much more so than the mere figures indicated. But whatever was favourable about the accounts was really due to the executive officers carrying out the principles and instructions of the Board. The Directors knew perfectly well, when they took a new considered line of policy, it was going to be carried out most effectively, and that they never need give it another thought after it had passed into the hands of Mr. Cross (their Engineer and General Manager) technically, and Mr. Sandell financially.

Mr. E. L. BURTON seconded, and remarked that there were two sets of figures on the credit side which were extraordinarily creditable. The first was the price of gas—4s. 6d. per 1000 c.ft. He remembered the time when the Lea Bridge Company's price was, if not the highest, at any rate one of the highest, to be found in or about London. All this was now changed; and to realize that their Company, in the period under review, were selling gas at a price less than was charged by the Gas Light and Coke Company and the South Metropolitan Company —the latter of whom had stood for cheap gas for decades past—was something for which they had to thank all those who were responsible for the administration of the undertaking. The second figure to which he wished to allude was the sum of £23,047 obtained from the sale of residuals. In relation to the cost of materials carbonized, this was one of the best figures he had seen.

Mr. SANDELL, in acknowledging the vote, said it was true that in the past the Company had had to charge a very high price for gas; but they must remember that at that time the business was not a tithe of what it was to-day. He could recall when the Company charged 6s. 6d. per 1000 c.ft.; and from that time onwards they had always done their best to sell gas at as low a price as possible. Just before the war broke out, they had reduced the price to 2s. 11d., at which they might have paid a dividend of 7½ p.ct.; but since then they had naturally been compelled to increase the price of gas because of circumstances over which they had no control. No one regretted more than he did the necessary high price and correspondingly low dividend.

Mr. F. W. CROSS said that in return for their confidence, he would like to take them into his confidence. He wanted to ask for more money, because they must have money to develop the district, which

was growing. He had just been looking up some figures, and found that in 1895 (the year before he came there) the number of consumers was 1350, and the sale of gas 78,000,000 c.ft. The number of consumers now was over 26,000; and the output of gas was more than 750,000,000 c.ft. This meant work, and it meant money; and his greatest trouble at the present moment was to supply the gas that was demanded of them. It was only for a short time they would have these dividend troubles; and the latent power of the Company was wonderful. It was this which they wanted to show to the proprietors and to the investing public.

The proceedings closed with a vote of thanks to the Chairman and Directors, which was accorded on the proposition of Mr. BECK.

HARROW AND STANMORE GAS COMPANY.

An Anxious Time.

The Ordinary Half-Yearly Meeting of the Company was held last Monday, at No. 5, Great Winchester Street, E.C.—Mr. ARTHUR F. PHILLIPS (the Chairman) presiding.

The ENGINEER and SECRETARY (Mr. Charles Chambers) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN said that from the capital account it would be seen there was an expenditure of £2262; but as £4555 was written-off for depreciation, the total capital expenditure figured at £237,806, which was £2292 less than it stood at on Dec. 31 last. The revenue account showed that coal, oil, and coke for the manufacture of gas cost £9390 more than during the corresponding previous half year. Carbonizing wages were up £863, repairs of works £843, distribution charges were £5185 more, rates and taxes showed an increase of £776, while all other charges remained much the same. The receipts for gas were £11,843 more, due to increased consumption and higher price; and products realized £3548 more. The result of the half year's working was a balance of £7954, which was £1327 less than for the corresponding half year. Adding this half year's balance to that brought forward (£5536), with £369 interest on deposit, and deducting interest on debenture stocks and income-tax, left a balance in the profit and loss account of £11,253. The dividend recommended would absorb £5068, leaving £6184 to carry forward. To meet the further increase in the cost of coal and other material, as well as the considerable addition to wages, the price of the gas was increased 6d., to 5s. 2d., per 1000 c.ft. from Midsummer last. As this would reduce the dividend on the ordinary stock to 3¼ p.ct. per annum, an application had been made to the Board or Trade, under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, to authorize the payment of a dividend of three-fourths of the standard, £3 15s. p.ct., for the current half year. The Gas Regulation Bill had now passed, and the Directors hoped under its provisions the pre-war rate of dividend might again be paid; but this could not come into operation before next year. It was an act of justice to which the proprietors of gas stocks were more than entitled. He knew of no industry that had suffered so much from causes arising out of the war as the gas industry; and yet they worked most loyally to provide the materials of vital importance for the production of explosives, at a considerable loss in the cost of the plant that had to be put down and the price they were paid for the material they supplied. The past six months had been an anxious time for the Directors and those who had the conduct of the Company's business. The prices of coal, labour, and all material were ever on the increase; and it required the greatest attention to obtain the supplies of coal necessary to carry on the business. It must be realized that, since pre-war days, coal had increased in price over 200 p.ct., wages 140 p.ct., and other materials required 230 p.ct.; while the price of gas, even with the last increase, had only risen from 3s. 2d. to 5s. 2d. per 1000 c.ft., or 63 p.ct. The gas sold last half year showed an increase of 6·43 p.ct. on the previous year. He had recently inspected the works, and found them in excellent order, and capable of meeting the probable demands of the coming winter; but the carbonizing plant was approaching its limit, and they must look forward to an extension probably next year. In conclusion, he moved that the report and statement of accounts be received and adopted.

The VICE-CHAIRMAN (Dr. J. W. Lee Glaisher) formally seconded the motion.

Mr. BATHE referred to the letter issued by Dr. Charles Carpenter to the proprietors of the South Metropolitan Gas Company, and asked how the new provisions explained therein would affect their own Company.

The CHAIRMAN replied that the provisions alluded to were contained in the South Metropolitan Company's Private Act, and so, of course, applied only to them at present. They were to have a certain price for the gas which they sold; and if they made a profit beyond what was required to pay the dividend fixed, it was to be divided among proprietors, consumers, and employees.

The resolution was then unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. SAMUEL CUTLER, dividends were declared for the half year ended June 30 at the rate of 4 p.ct. per annum on the 5 p.ct. ordinary stock, and at the rate of 5 p.ct. per annum on the preference stock, both less income-tax,

The CHAIRMAN proposed a vote of thanks to the officers, the staff, and all in the Company's employ, for their services during the past half year. He believed they all worked most loyally; and the accounts themselves showed that the results were satisfactory.

Mr. A. M. PADDON, who seconded, expressed himself as being fully in agreement with what the Chairman had said.

Mr. CHAMBERS, returning thanks, remarked that, though they had all hoped things by this time would have been getting better, they did not seem to have improved much. He had been expecting to have a new water-gas plant at work next month; but he had just had a letter informing him that it would be six or seven months before the castings were ready. Fortunately, the work was put in hand in good time, and they could get along with the existing plant. This showed, however, the sort of difficulties they had to contend against.

Mr. PILLEY proposed a hearty vote of thanks to the Chairman and Directors for their devotion to the interests of the proprietors during the past half year. It had been a half year full of difficulties; and he much feared the half year before them would be an equally, or even more, difficult one. There was before them the shadow of a great coal strike, which was bound to add to the anxieties of the Directors.

The CHAIRMAN, in acknowledgment, agreed that there were probably still greater anxieties ahead.

GLOUCESTER GAS COMPANY.

Centenary of the Undertaking.—Retirement of the Secretary.

This being the Centenary Year of the Gloucester Gas Light Company, there was an unusually large attendance of shareholders at the half-yearly meeting, which was held at the Offices, in Eastgate Street, on Tuesday afternoon of last week—Mr. J. H. JONES (the Chairman) presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said they would agree that the accounts were good—showing a great increase in the consumption of gas, and in all other ways. It was not satisfactory to be charging 4s. 10d. per 1000 c.ft. for gas, in place of the pre-war 1s. 10d.; but the war had altered everything, and many places were paying a good deal more than was charged in Gloucester. A satisfactory feature in the accounts was the amount of money in the business which did not bear interest as against the Company. They had premiums on stock sold about £5700, a transfer from profit and loss account in 1898 of £10,000, a reserve fund of £18,000, and a substantial balance to be carried to the next account. But instead of having, as formerly, a credit balance with their bankers, they owed them over £10,000; and as soon as possible the Directors hoped to avail themselves of the Public Utilities Companies (Capital Issues) Act, and get leave to obtain further money on reasonable terms. Taking it altogether, they might consider that in this, the hundredth year of existence, their undertaking was a thoroughly good and safe business proposition, with great possibilities of increase and usefulness before it. Throughout its career, so far as they could see, the Company had been managed on prudent lines. The directorate had been good, and the management in the secretarial and engineering directions had been good also. Looking through the old books, he was pleased to find that his grandfather, Samuel Jones, was among the earliest and largest shareholders—his name appearing in 1821. Then an uncle and his father, and later he himself, had been associated all the time with the Company. He was glad to refer to their valued Secretary, Mr. W. E. Vinson, now retiring from his post after 41 years of faithful service. He followed his father after 27 years of similar service. So that for more than two-thirds of the century, the Vinsons, father and son, had been practically responsible for the financial and business management of the undertaking. All were sorry that the tale of years had induced Mr. Vinson to retire; but they were glad that he should have a time of respite from hard work, and hoped to see him there for many years to come, and to get the benefit of his experience and advice. All present would concur heartily in the Directors' selection of Mr. Vinson to fill a vacancy on the Board. As to Mr. Vinson's successor, Mr. T. B. James, the Directors had the greatest confidence in appointing him as Secretary. A Centenary Celebration did not come during the lives of all directors; and the Board thought that the occasion should be celebrated by a gathering of all in the employ of the Company, including the wives. In these days of unrest, it was good-will that was wanted above everything. They had always got on well with the employees. In entering upon the second century of the Company's existence, they might all feel confident that its career would continue to be a prosperous and useful one.

The report and accounts were adopted, and the statutory dividend of 5 p.ct. (less income-tax) was declared.

Mr. VINSON, in thanking the Chairman and other speakers for their appreciative references to his services, gave an interesting outline of the Company's history during his connection with it. When he first entered the office, his father was Secretary, and Mr. W. S. Morland's father was the Engineer. The number of consumers was then 1604, and the consumption of gas 51 million c.ft. a year. The business continued to grow; and it being impossible to extend the then existing premises, a new Act of Parliament was obtained, and a site procured at Hempsted. Gas was first supplied to the city from there in 1878. A year later, when he took over the position of Secretary, the number of consumers was 2605, using 108 million c.ft. of gas. Now there were between 12,000 and 13,000, using 435 million c.ft. a year. Referring to the successful efforts made by the Company to bring gas largely into use for such purposes as cooking, heating, and power, he said that when he took over the secretaryship they had only one gas cooking-stove on hire, and now they had 10,000; while during the last four years they had sold something like 3000 gas-fires. The reduction in the price of gas continued, until it got down as low as 1s. 10d. per 1000 c.ft., less 5 p.ct. discount; but then the war came upon them all. In 1896 the Company started to supply gas under the prepayment system, which had been a great success. Somewhere about 1902 he obtained the permission of the Board to introduce a few incandescent burners in the street-lamps, which proved so satisfactory to the Corporation that they had them placed in the lamps all over Gloucester.

The Zoning and Grading Scheme.—The Executive Committee of the Joint Industrial Council for the Gas Industry met in London last Thursday, and drafted a scheme of zoning and grading of workers employed in the various gas undertakings throughout the country. The scheme is to be sent to the Regional Councils for them to act upon. The embargo placed upon local authorities through the petition for higher wages presented some time ago has been removed. A further meeting will be held when the matter has been discussed by the Regional Councils.

RICHMOND GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly Meeting of the shareholders of the Richmond Gas Company was held on Thursday last—Mr. HENRY PULLMAN, J.P. (the Chairman), presiding.

The CHAIRMAN said: In submitting the half-yearly accounts, I claim your attention for a few salient points appearing in the revenue account for the half year under review, as compared with the corresponding period of 1919. On the one hand, the sale of gas amounts to £39,727, as compared with £37,584, an increase of £2143. There is an increase of £755 from public lighting, and £497 increase in rental from meters, stoves, and fittings. The sale of coke amounts to £17,188, as against £12,910—an increase of £4278. Tar shows an increase of £2198, and sulphate of ammonia an increase of £716. The revenue from all sources shows an increase of £9766. Purification again shows a credit of £79; the profit on the sale of spent oxide more than covering the cost of purification. Manufacturing wages disclose a decrease of £1176, due to improved methods.

A TRIBUTE TO THE ENGINEER AND MANAGER.

It would be appropriate here to pay a tribute to the ability, skill, and untiring energy, under most adverse conditions, of our Engineer and Manager (Mr. George Hutchinson), to whom we are greatly indebted for this substantial improvement. On the other hand, the cost of coals was £30,372, as against £28,772—an increase of £1600. Repairs to works and plant show an increase of £7696, due to deferred renewals owing to war conditions. Repairs to mains and services show an increase of £258. Repairs and renewals of meters show an increase of £811, owing to a larger number of meters repaired and increased costs. Public lamps, &c., show an increase of £868, due to renewals of worn-out lamps, extra costs in wages, and larger number of lamps in lighting. Rates and taxes show an increase of £383. In spite of all, the profit and loss account reveals a net profit of £6768; and the proposed dividend at 3¾ p.ct. will absorb £3400. The sum of £185 has been added to the unappropriated balance; making the amount £3368.

LABOUR AND COAL QUESTIONS.

Having now dealt with the balance-sheet and the results of the workings for the past half year, I will, with your permission, say a few words on topics which are in the minds of those present, and the prospects for the future. It has become fashionable, of late, to give the subject of Labour a prominent place when shareholders meet to consider balance-sheets. So I will follow the fashion. Since the period of the last statement of accounts and balance-sheet, two demands for increase of wages have been received from the union representing the employees in gas-works. At the beginning of the year an arbitration award gave the men an increase of 5s. per week, to commence from the early part of December last. Hardly had this demand been considered and settled when another request was received by the Federation of Gas Employers from the Workers' Unions for a further increase of 10s. per week, and better terms for overtime work and an extension of holidays. This was resisted by the Federation; and the matter was not settled until June 30, after a national strike had been threatened. Hardly had this been arranged when, within one month, a further demand was received from the Unions, asking for a further 1s. a day. This the Employers' Federation have definitely refused to consider; and at the present time the Unions are not pressing their claim. You see, therefore, that in the labour world great unrest exists; and this is not likely to disappear in the near future. I am of opinion that a considerable proportion of the unrest is caused and fomented by the Unions without the knowledge of most of the men who comprise the membership of the Unions. There is evidence to show that the majority of the men employed by this Company were not aware of these demands until after they had been made. Liberty of the subject, about which we hear so much to-day, appears to be fast passing from those who cry so loudly for it. The question of coal, which is much in the minds of the public at the present time, is not one causing less anxiety to your Directors. I am pleased, however, to say that supplies have been somewhat easier to obtain; but the cost is constantly rising. It seems to be the first raw material which feels the rise in markets—in fact, it more often is the first cause of such rises. There does not appear to be much prospect of the cost of coal becoming lower; and if the threatened strike should take place, undoubtedly it will increase. Let us hope that some way out of the present *impasse* will be found; for it seems almost incredible that the Government or the people will allow the country to be thrown into a chaotic state by the stoppage of mines, railways, and transport. Should such a catastrophe take place, provided the labour in gas-works remains loyal, this Company will be able to continue to produce gas for quite a few weeks.

RESIDUALS SALES AND THE PRICE OF GAS.

You will have noticed with pleasure the great increase in revenue from the sale of residual products. The business in this department has been phenomenal, and has, to a very large extent, been the cause of the absence of any increase in the price of gas during the past half year. Coke has followed very closely the value of coal; but tar has brought in nearly double the revenue produced in the corresponding period of 1919. The demand for pitch on the Continent (to take the place of coal, which cannot be obtained), and the enhanced value of tar products by the dyeing industry, account for the high returns. The market for tar continues to rise, and is likely to do so.

THE GAS REGULATION ACT.

I think you will not expect me to conclude my observations without making some reference to the Gas Regulation Act, which has lately received the Royal Assent, and so become law. The gas industry, through the National Gas Council, has worked hard to obtain this Act, and to extract from Parliament the relief, which was overdue, to enable gas undertakings to continue even to exist. It is early days yet to express a very definite opinion upon the benefits which will be obtained by the operation of the Act; but undoubtedly it will be the means of bringing the value of stock to that more nearly approaching its pre-war value. Applications for operating the Act will not be received by the Board of Trade until October, by which time they will have issued instructions as to the procedure. It is hoped that Orders for working the Act will not be difficult to obtain after the Department has got into working order, though, of necessity, some time must still elapse before the 800 or 900 authorized gas undertakings all obtain their Orders. Gas is to be sold on an entirely new basis. The illuminating standard will be abolished; and, in future, the consumer will pay for what he obtains in heating value, instead of the measure of the quantity of gas he uses. Under existing arrangements, he pays for the cubic feet that the meter records as having been registered, irrespective of its heating quality. In future, however, he will pay per cubic foot used; but the quantity will be corrected for its quality. A parallel case, which perhaps may be better understood by some present, would be that of a bottle of whiskey being sold at a price varying, up and down, according to the strength of the spirit contained in the bottle. The unit of sale will be changed from so much per 1000 c.ft. to so much per unit of heating value, which is to be called a "therm," and which will cost from 1s. to 1s. 6d., or somewhere round about these figures. The provisions under the Act for the payment of interest on capital are very broad and wide, and do not define the amount of dividend which may be paid; but it gives the Board of Trade power to permit additions to the selling price of gas, which will compensate for the increases in cost of manufacture due to circumstances beyond control, or which could not reasonably be avoided, and which have occurred since the 30th of June, 1914.

THE OUTLOOK.

I think I have said enough to indicate that the times are hard, the working road rough, and, at times, the anxieties to your Directors grave in the extreme. No advantage, however, is gained by taking too pessimistic a view of things, and there is hope that, if the country will only settle down to hard work, and endeavour to regain its pre-war proportion of common sense, there is a very bright future before the gas industry; for its productions are in greater demand than ever before in the history of its existence. In conclusion, I trust it is unnecessary to offer the assurances of myself and my colleagues that the furtherance of the interests and advancement of this Company have ever been, and will always be, their first care and consideration. I now beg to move that the accounts as presented be received, adopted, and entered upon the minutes. But before putting this resolution to the meeting, I shall be very pleased to answer any question addressed to me.

Dr. W. A. WARD seconded the resolution, which was adopted.

THE DIVIDEND.

The CHAIRMAN then moved that a dividend be declared at the rate of 3¾ p.ct. per annum on the consolidated stock for the half year.

Colonel LESLIE POWELL, in seconding, said that he shared the Chairman's regret that the Directors could not declare a more adequate dividend, but pointed out that it was at present limited by Act of Parliament. He hoped that when they again met, the difficulties in the respect indicated would have been removed, and that they would be able to declare a dividend which more correctly represented their earnings.

The motion was agreed to.

THE DIRECTORS THANKED.

Mr. WATERS, in moving a vote of thanks to the Chairman and Directors, said he considered that, in view of all the difficulties the Directors had encountered, the report was very satisfactory.

Mr. COOMBES seconded, and the resolution was carried.

PRAISE FOR THE OFFICIALS AND STAFF.

The CHAIRMAN, responding to a vote of thanks to the Directors, said: It is very encouraging to us that our efforts are appreciated by the shareholders. We have experienced a very strenuous year, and had to face enormous difficulties; but, thanks to the loyal support we have received from our most capable and energetic Engineer and General Manager (Mr. E. G. Hutchinson), and our Acting Secretary (Mr. Gooderham), we have been enabled to weather the storm and to emerge with a creditable balance. I cannot speak too highly of the valuable services rendered by our Engineer and Manager. Never before in the history of gas undertakings have the management had to face such tremendous difficulties, and we are greatly indebted to Mr. Hutchinson for the admirable way in which he has overcome all difficulties and conducted the business of the Company. The secretarial work has also been well done by Mr. Gooderham. I have much pleasure in proposing a vote of thanks to the staff, coupled with the names of Mr. Hutchinson and Mr. Gooderham.

Mr. DOHERTY, in seconding, said he could also bear testimony to the loyalty and ability of the Engineer and General Manager and the Acting Secretary. Both these gentlemen had rendered very excellent service.

Mr. HUTCHINSON, in response, thanked the Chairman and Mr. Doherty for their kind and generous references on behalf of himself and the staff, and assured them that everything possible had been done and would continue to be done by all the staff and workmen to further the interests of the Company and consumers.

Mr. GOODERHAM said it was very encouraging to have the confidence of the Directors. He assured them they would continue to do their best for the Company.

New Companies.—The Montrose Gas Company has been formed to take over the business of the Montrose Gas Light Company. The capital is £22,500, in £1 shares. The Record Gas Mantle Company has been registered with a capital of £750,000 in £1 shares.

Cheltenham Gas Price.—The Cheltenham Gas Company have issued a notice to the effect that, on and from the resumption of the supply of gas, consumers within the borough will be charged 5s. 6d. per 1000 c.ft., and in the outlying districts 6s. 2d.; while there will also be increases in the rents of meters and cookers. It will be seen that, as regards the price of gas, the Company are exercising to the full the powers conferred on them by the new Order of the Board of Trade, by raising the charge from 4s. to 5s. 6d.

GAS AND WATER WORKS FACILITIES ACT.

Report by the Board of Trade on Provisional Orders for 1920.

In a report by the Board of Trade of their proceedings during the session of 1920 under the Gas and Water Works Facilities Act, 1870, it is stated that in December, 1919, fourteen applications were made to the Board (eight relating to gas undertakings) for Provisional Orders under the Act. The following were the gas applications: Braintree and Bocking, Great Marlow, Great Yarmouth, Ilford, Mablethorpe and Sutton, Stone, Taunton, and Watford. The amount of capital proposed to be authorized by the applications was £647,000 share capital, and £302,348 loan capital.

OBJECTS OF THE APPLICATIONS.

Braintree and Bocking Gas.—To empower the Braintree and Bocking Gas Company, Ltd., to construct additional gas-works, to raise additional capital, and for other purposes in connection with their undertaking.

Great Marlow Gas.—To empower the Great Marlow Gas Company, Ltd., to raise additional capital, and for other purposes.

Great Yarmouth Gas.—To empower the Great Yarmouth Gas Company to raise additional capital.

Ilford Gas.—To empower the Ilford Gas Company to raise additional capital, purchase additional lands, construct additional gas-works, and for other purposes.

Mablethorpe and Sutton Gas.—To empower the Mablethorpe and Sutton Gas Company, Ltd., to raise additional capital, and for other purposes.

Stone Gas.—To extend the limits for the supply of gas by the Stone Gas and Electricity Company, Ltd.

Taunton Gas.—To empower the Taunton Gas Light and Coke Company to raise additional capital, and for other purposes.

Watford Gas.—To authorize the Watford Gas and Coke Company to construct and maintain additional gas-works, and for other purposes.

OPPOSITION.

No objections were lodged against the Great Marlow, Great Yarmouth, and Stone applications; and the objections lodged against the Taunton Order were subsequently withdrawn. The objections and representations made with regard to the other applications were duly considered by the Board. In the cases of the Braintree, Ilford, and Watford applications, it was found necessary for an officer of the Board to inspect the site of the additional gas-works proposed to be constructed.

The Watford application was opposed by the Watford Urban District Council on the ground that the proposed gas-works, which would be of considerable size, would injure the amenities of the district, and in particular would affect prejudicially a large housing scheme. It appeared, however, the nearest point of the site on which the houses were to be erected was approximately a quarter-of-a-mile from the gas-works site, and after an inspection of the two sites and careful consideration of the evidence put forward at an inquiry held in the matter, the Board decided to grant a Provisional Order authorizing the construction of the gas-works.

CONFIRMATION OF PROVISIONAL ORDERS.

Bills to confirm the Provisional Orders made by the Board were introduced into the House of Commons as follows:

Gas Provisional Orders Bill, to confirm Provisional Orders relating to Braintree and Bocking Gas, Great Marlow Gas, Ilford Gas, Stone Gas, Taunton Gas, and Watford Gas.

Gas and Water Provisional Orders Bill, to confirm (among others) Provisional Orders relating to Great Yarmouth Gas and Mablethorpe and Sutton Gas.

OPPOSITION IN PARLIAMENT.

Petitions were lodged in the House of Commons against the Gas Provisional Orders Bill by the Watford Urban District Council and the Hertfordshire County Council in respect of the Watford Order. The former petition was withdrawn, after an agreement had been come to with regard to certain amendments; and the *locus standi* of the Hertfordshire County Council was disallowed by the Standing Orders Committee on appeal by the promoters of the Watford Order.

A petition was lodged in the House of Lords by the Great Northern Railway Company against the Gas and Water Provisional Orders Bill in respect of the Mablethorpe and Sutton Order, though the Railway Company had not opposed the Order when it was before the Board of Trade. After certain amendments had been agreed between the parties, this petition was withdrawn.

The two Bills received the Royal Assent on Aug. 4.

HALIFAX GAS MANAGEMENT VINDICATED.

At last week's Halifax Town Council meeting, a long discussion took place on a drastic proposal by Mr. W. Court (a Socialist member) that a Committee of Inquiry should investigate and report upon the incidence of local gas charges and the cost of production and distribution. He disclaimed any intention of reflection on the gas-works management, but said the motion was intended to secure information of the actual charges to large consumers in comparison with slot-meter users. It was suggested by him that, while large consumers had obtained about 7 million c.ft. a year for £1100, poor people, who were really the largest consumers, paid over £16,000 per 100 million c.ft. If proper charges were made, the people should be able to get gas at considerably less than 5s. per 1000 c.ft.

The Mayor regretted that Mr. Court should think it necessary to press this motion, which practically amounted to a vote of censure on the gas management, which was not justified. The information desired could be obtained from the abstract of accounts. The Halifax Gas Department had one of the largest day loads of any gas undertaking in the country; and the Committee were right in trying to cater for big users for power at as low a price as possible. Alderman Morley said it was desirable that information should be obtained as to the dividing-line between the price for business and non-business consumption. The abstract of accounts showed that gas had been sold to these large consumers at 3·91d. per 1000 c.ft. less than the cost of manufacture. It was time this method was criticized. Alderman Clay said if they were to insist on a flat-rate, or interfere seriously with the preferential rate for large users, the Gas Committee would be put into trouble. On a vote, the proposition was defeated by a large majority.

Subsequently, on the proposition of Alderman Morley, the Council agreed that the Gas Committee should return to pre-war methods in making monthly returns of gas affairs to the Council, with the usual comparisons between each month and the corresponding month of the previous year. Mr. Waddington (the Chairman of the Committee) admitted that the present returns did not quite correspond with the pre-war returns, but said that the Committee had considered them as satisfactory.

PROFITEERING CHARGE DISMISSED AT HEREFORD.

Prepayment Meter Rates Challenged.

As the result of a resolution passed at the King Street Adult School, protesting against an alleged overcharge for gas supplied through prepayment meters, there was a sitting of the Hereford Profiteering Tribunal on Monday of last week to inquire into the action of the Corporation. There was a long hearing, during which at times a good deal of feeling was shown; but in the end the Chairman said that the Committee had power only to administer the Act of Parliament; and they unanimously decided that no case of profiteering within the meaning of the Act had been made out. They found that the charge for gas to prepayment consumers was exactly the same as that to ordinary consumers, and that the charge for additional services rendered (which had been 1s. 1d.) had now been reduced to 1s. per 1000 c.ft.

The case was presented by Mr. Bellers, who said that what was objected to was an apparently illegal charge of 10d. per 1000 c.ft. to prepayment consumers. They relied upon the fact that the legal charge was 6s. If, as he was told, the prepayment meters released 15 c.ft. for a penny, this worked out at nearly 5s. 7d. per 1000 c.ft. On July 1 a notice was issued that an extra 1s. 3d. would be charged, making a total of 6s. 10d. per 1000 c.ft., or 10d. over the legal maximum. If it was sought to justify the extra charge as rental of meter, stove, and fittings, he would point out that in many cases the fittings were the landlord's property. In one case he said the extra sum collected apparently for rental of stoves and fittings was £4 a year—which "was the rental of a cottage, garden, and orchard in the country." The present quality of the gas was such that it would have been very highly priced at 1s. 6d. per 1000 c.ft. before the war, so "who could blame them for kicking when they were asked to pay nearly five times as much for gas?" Had the electric light department (with a much smaller percentage increase in price) been favoured at the expense of the gas undertaking? On behalf of the poor, he asked for "justice with a leaning to mercy, and the benefit of the doubt."

Alderman Witts, who replied for the Gas Committee, was frequently interrupted, but he got his points in all right; an early remark being that now "so many people wanted something for nothing, that the time was more than ripe when fallacies should be exposed." The Gas Committee had been rightly charged with making the penny-in-the-slot consumers pay 1s. per 1000 c.ft. more than the ordinary consumer, and 10d. more than the Act of Parliament allowed. But, reading the Act, he pointed out that this specifically stated gas for lighting only; and gas for other services could be supplied by the Council under their own arrangements as to price. As a matter of fact, they did not charge up to their maximum of 6s., but only 5s. 10d., to penny-in-the-slot and ordinary consumers alike. The 1s. extra charged to the penny-in-the-slot consumers was for extras, none of which were supplied to the ordinary consumers—such as free cooker, free meter, free piping, free maintenance, free repairs, &c. If they gave all this for nothing, it meant 5d. in the pound on the rates, and how would the ratepayers relish paying, as they did, for their own gas at the same price as was paid by the penny-in-the-slot consumers, and in addition 9s. rent for cookers, 6s. for meter—both of which would be raised by 50 p.ct. on Sept. 29—together with their own piping, gas fittings, repairs, &c., with labour at 2s. per hour? And on top of all this a 5d. rate to give all these things free to the penny-in-the-slot consumer. The conditions under which the consumer used the penny-in-the-slot meter were clearly laid down in the agreement signed by the landlord of the house, and accepted by the tenant; and, if it was not desired, there was nothing to prevent them using the ordinary meter. It had been laid down for the guidance of the Committee that no person or corporation could make a larger percentage of profit than was made in 1914. This was the crux of the whole matter. Now, in 1914, the Corporation made a profit on the gas undertaking of £3849. In 1919 the Committee made a loss of £2669. In 1914 the penny-in-the-slot consumer paid 1s. 1d. extra per 1000 c.ft. Now, in 1920, he paid 11½d. extra; so that he actually paid just under 2d. less for the benefits received in 1920 than in 1914. These two facts disposed of the case. The consumer whose case had been quoted could adopt the ordinary meter if he chose; but in that case the Gas Committee would demand of him 13s. 6d. for his cooker, 9s. for his meter, and payment for fittings, piping, &c., which would leave him no better off. Of the 3000 gas consumers, about two-thirds were small and the other third large; and if the cost of the services was not averaged over the 3000, the poorer customer would have to pay, roughly, anything up to 2s. 6d. per 1000 c.ft. for his services. By no stretch of the imagination could it be said that the Gas Committee were profiteering, after the figures he had given them.

The Batley Corporation have advanced the salary of Mr. R. H. Duxbury, their Gas Engineer, by £150, to £550 per annum.

POSITION OF LONDON'S GAS SUPPLY.

An Interview with Mr. M'Leod.

After remarking that the gas consumer will derive some little satisfaction from the news that more than one of the companies in Greater London have found themselves in a position to cancel summer notices to increase charges, a representative of the "Daily Telegraph" last Thursday gave the following account of an interview he had with Mr. F. M'Leod.

Mr. Frederick M'Leod, the Secretary of the South Metropolitan Gas Company, an enterprise whose record both in regard to scientific production and in industrial organization gives it a unique position in the gas world, explained the difficulty of prognosticating about the coming winter. "To most of the London companies," he said, "the effect of the rail charges is not yet fully known, because the coal is partially rail and partially water borne. The rail charges at the other end vary, too, in accordance with the distance of the pits from the point of shipment. Until a month has gone, we shall not probably get a clear conception as to how much the increase means per ton on the average; so that it is quite impossible to say now to what it is likely to lead."

Even without considering the effects of a possible strike of miners, the prospects for the winter are sufficiently obscure to discourage comment at present. A total stoppage of the supply of coal to the gas companies could not fail, in Mr. M'Leod's opinion, to have the most disagreeable consequences. "If the supply were to fail," he declared, "he would be a bold man who would venture to make a forecast. Of course, the whole position as regards coal supplies is known only to the Coal Controller. Naturally the companies have done their best during the summer to build-up stocks so far as facilities have allowed; but if you reflect upon the number of tons dealt with by the London undertakings during a week—I should say that in a month's time they will be carbonizing 100,000 tons—you will realize that, with the best provision possible, the result of a total stoppage of supplies would be decidedly unpleasant."

In round figures, it may be noted, the amount of coal necessary to provide London with twelve months' gas supply is nearly 4,500,000 tons. Of this quantity 3,500,000 tons are dealt with by the three companies—the South Metropolitan, the Gas Light and Coke Company, and the Commercial Gas Company—who employ between them some 23,000 persons; the remainder being required by the eight undertakings from which suburban supplies are mainly drawn.

After explaining the provisions of the Gas Regulation Act, the writer said, with regard to the new method of charge: The advantages of the new system are shared all round. The consumer is, in common parlance, assured of "a fair deal" as between himself and his gas company. The latter, it is claimed, is afforded means of entering more effectually into competition with electric power by reason of being able to place a clear statement of possibilities with either form of energy in front of the consumer. Further, a test of efficiency in manufacture is provided by computing the number of gaseous heat units produced per ton of coal consumed.

One of the earliest companies to adopt the new system of sale will be the South Metropolitan Gas Company, whose Act, which received the Royal Assent on Aug. 4, made provision to this end on somewhat similar lines to those of the Gas Regulation Act. The Act, while doing away with the old sliding-scale, which varied dividends in inverse relation to the price of gas, limited dividends payable on ordinary stock to 5 p.ct., and, in addition, maintained the old principles of co-partnership and of giving the consumer the first fruits of economic working. Of the surplus profits of the Company, under the Act three-fourths will go to the consumer, and the remaining one-fourth will be equally divided among the ordinary stockholders and the employee co-partners of the Company—the latter receiving their share through the co-partnership fund allocated by way of a uniform percentage of bonus on salaries and wages.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept. 6.*

There is very little alteration to report in the London tar products market; prices remaining extremely firm. Pitch is worth not less than 210s. per ton f.o.b. makers' works; and the demand does not seem to slacken. Oils are worth about 1s. 4d. per gallon net and naked at sellers' works; but there is no great quantity available for sale between now and the end of the year. Solvent naphtha is firmer in conjunction with the rise in the price of benzole. Pyridine remains unchanged at 21s. per gallon for 90-140 quality; and the price of naphthalene crystals has reached £55 to £60 per ton.

The official prices for sulphate of ammonia have been increased by 3s. 6d. per ton, to cover the recent increase in railway rates.

Tar Products in the Provinces.

Sept. 6.

The average values for gas-works' products during the week were: Gas-works coal tar, 117s. 6d. to 121s. 6d. Pitch, East Coast, 205s. to 210s. per ton f.a.s.; West Coast—Manchester, 186s. to 190s. 6d.; Liverpool, 186s. to 190s. 6d.; Clyde, 186s. 6d. to 190s. 6d. nominal. Benzole 90 p.ct. North, 2s. 6d. to 2s. 7d.; crude 65 p.ct. at 120° C., 1s. 10d. to 2s. naked at makers' works; 50-90 p.ct. naked, North, 2s. 4d. to 2s. 6d. Toluol, naked, North, 2s. 6d. to 2s. 7d. nominal. Coal tar crude naphtha in bulk, North, 11½d. to 1s. Solvent naphtha, naked, North, 3s. to 3s. 2d. Heavy naphtha, North, 3s. 4d. to 3s. 6d. Creosote, in bulk, North, liquid, 1s. to 1s. 0¼d.; salty, 11½d. to 1s. Heavy oils, in bulk, North, 1s. to 1s. 0¼d. Carbolic acid, 60 p.ct.,

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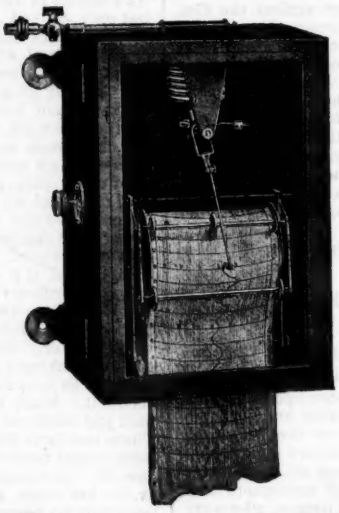

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3s. 11d. to 4s. Naphthalene, £40; salts, £9 to £9 10s., bags included. Anthracene, "A" quality, 1s. per minimum 40 p.ct.; "B" quality, nominal.

Manchester District Tar Prices.

The average price realized for the sale of tar for the month of July, according to the sliding-scale, was £7 11s. 10·92d.

FROM A MARKET CORRESPONDENT.

Tar Products.

Considerable uncertainty prevails in markets for bye-products, owing to the black outlook in connection with the threatened coal strike. Neither buyers nor sellers know what to do while the uncertainty lasts. There is, however, a feeling in many quarters that a strike will be avoided; but it is only a feeling, and quite insufficient to cause the trade to ignore the possibility of a strike. One of the strongest features of the market is pitch, which remains as scarce as ever, particularly in the North; and prices are still on the up-grade. Both London and South Wales buyers are now paying £11 to over. In the North the price is not as high as this; and although there is some difficulty in fixing quotations, it is known that offers of £10 5s. have been refused in Manchester and £10 15s. on the East Coast. With the opening of September the additional charge of 3s. per ton on the carriage of pitch by rail has come into operation, and provides subject-matter for considerable discussion—makers claiming that pitch should be classified with fuels. There is further weakness in solvent naphtha; and though the quotation is given at 3s. per gallon, buyers could probably do better than this. Heavy naphtha has not altered. Crude naphthalenes are now very much wanted in the fire-lighter trade, and low grades are making as much as £14. Better qualities sell up to £22. Refined is as scarce as ever, at from £50 to £55. Cresylic acid is lower; and carbolic acid is flat again—crude 60's being offered at 3s. 6d. to 3s. 8d. per gallon, and 40's crystals are almost unsaleable at 1s. per lb. Benzoles have been advanced; special motor spirit is now 3s. 11½d. per gallon. Creosote remains very firm; and the impression is gaining ground that prices are likely to advance further. Intermediate products are still none too plentiful, although quotations are very little changed. Aniline oil and salts are a shade dearer; while salicylic acid is cheaper.

The range of quotations is as follows:

Benzole: 90% London 2s. 5d. to 2s. 7d., North 2s. 4d. to 2s. 6d.; 50-90% 2s. 3d. to 2s. 4d. London, 2s. 2d. to 2s. 3d. North; crude 60-65%, 1s. 6d. to 1s. 8d.; pure, 4s. per gallon naked.

Crude Tar: London, 90s. to 95s.; Midlands, 85s. to 90s.; North, 85s. to 90s. per ton *ex* works. Refined tar, 70s. per barrel (free) on rail.

Pitch: London, 220s. per ton f.o.b.; East Coast, 215s. per ton; West Coast, 205s., with Manchester 200s. per ton, and Glasgow 210s. per ton; South Wales, 222s. 6d. per ton.

Solvent Naphtha: London, 2s. 11d.; Provinces, 2s. 10d.

Crude Naphtha: Naked, 10d.; North, 9d. per gallon.

Heavy Naphtha: 3s. 6d. per gallon.

Naphthalene: Refined, £56 per ton nominal; inferior, £35; crude, £14 to £22, according to quality.

Toluol: Naked, 2s. 11d. per gallon nominal. North, 2s. 9d. Pure, 4s.

Creosote: London, 1s. 1½d. to 1s. 2½d.; North, 1s. 1½d.; heavy oil, 10½d. per gallon in bulk.

Anthracene: 40-45%, 9d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Pyridine: 20s. to 25s. per gallon.

Aniline Oil: 1s. 11d. per lb., drums extra.

Aniline Salts: 2s. 2d. per lb.

Cresylic Acid: 95%, 4s. 9d. to 5s. 3d.; 97-99%, 5s. 6d. to 5s. 9d. per gallon *ex* works London, f.o.b. other ports.

Carbolic Acid: Crude 60%, 3s. 7d. per gallon; crystals 40%, 1s. per lb.

Salicylic Acid: Technical, 2s. 7d.; B.P., 3s. 3d. per lb.

Xylol: Pure, 6s. 9d.; commercial, 5s. 9d. per gallon.

Sulphate of Ammonia.

The amount of business passing is very satisfactory, especially on home account. Export trade is of smaller dimensions at rather lower levels. Owing to the increase in railway rates, which came into operation at the beginning of the month, the Ministry of Agriculture has sanctioned an increase of the agreed maximum charges by 3s. 6d. per ton in the case of all deliveries made since Sept. 1, except when such deliveries are in fulfilment of existing unconditional contracts for delivery at the original prices. The original agreed maximum prices will remain in force for deliveries made *ex*-works or by road.

Redcar Gas-Works Purchase Payment.—It had been rumoured that the Redcar Urban District Council would not be able to raise the money to take-over the local gas-works at the beginning of September, as provided for in the Act recently passed. At a meeting last week, however, the Clerk (Mr. R. M'Clean, J.P.) announced that the Council would be in a position to take-over the undertaking on Saturday, the 4th inst., and would be able to sign a cheque for £118,000 to complete the purchase.

Nottingham's Lighting Arrangements.—Much satisfaction is being evinced in Nottingham at the circumstances that the Gas Committee have at last seen their way to a reversion to pre-war lighting arrangements in the public streets. The perpetuation of the plan of keeping all the thoroughfares in darkness had cast a certain amount of ridicule upon the city. Now that normal conditions have to a large extent been restored, it is suggested locally that a comprehensive scheme of improving lighting arrangements, by discarding many archaic street appliances upon which reliance is still being placed, would not be to the city's disadvantage.

"Entente" fitted in grate.

GAS FIRES AND COAL GRATES.

III.

The "Entente" is a well thought out solution of the Inset Fire problem.

All incongruous iron framework has been eliminated, ensuring brick to brick contact between the gas fire and the coal grate.

When the fire is fitted into position it blends so harmoniously with its surround that it appears to be an integral part of the grate.

The brick, burner, injector, and fuels are all mounted on one common base-plate, ensuring absolutely accurate registration of these essential parts.

The "Elite" Gas Interior embodies many of the features of the "Entente" and will be found useful when the combination of a gas fire and a coal grate does not meet the views of Housing Officials.

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WORKS: Gothic Works, EDMONTON, N.18; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
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The Sir John Cass Technical Institute.

The new session of the Sir John Cass Technical Institute will commence on Monday, the 27th inst. The courses of instruction provided are specially directed to the technical training of those engaged in chemical, metallurgical, and electrical industries, and in trades associated therewith. Full facilities are provided for those wishing to carry out work connected with the industries in which they engage or to undertake special investigations and research. The chemistry, metallurgy, and physics laboratories are open both in the afternoons and evenings for work of this character. The instruction in experimental science also provides systematic courses in chemistry, physics, and in pure and applied mathematics for the examinations of London University, and in chemistry and metallurgy for the examinations of the Institute of Chemistry. Special courses of higher technological instruction form a distinctive feature of the work of the Institute. A connected series of lectures on "Fuel and Power," comprising liquid, gaseous, and solid fuels and their application, electrical supply and control, the transmission of power in works, fuel analysis and technical gas analysis, is also included in the syllabus of the chemistry department for the forthcoming session. Full details of the courses are given in the syllabus of the Institute, which can be had on application at the office or by letter to the Principal, Sir John Cass Institute, Jewry Street, Aldgate, E.C.

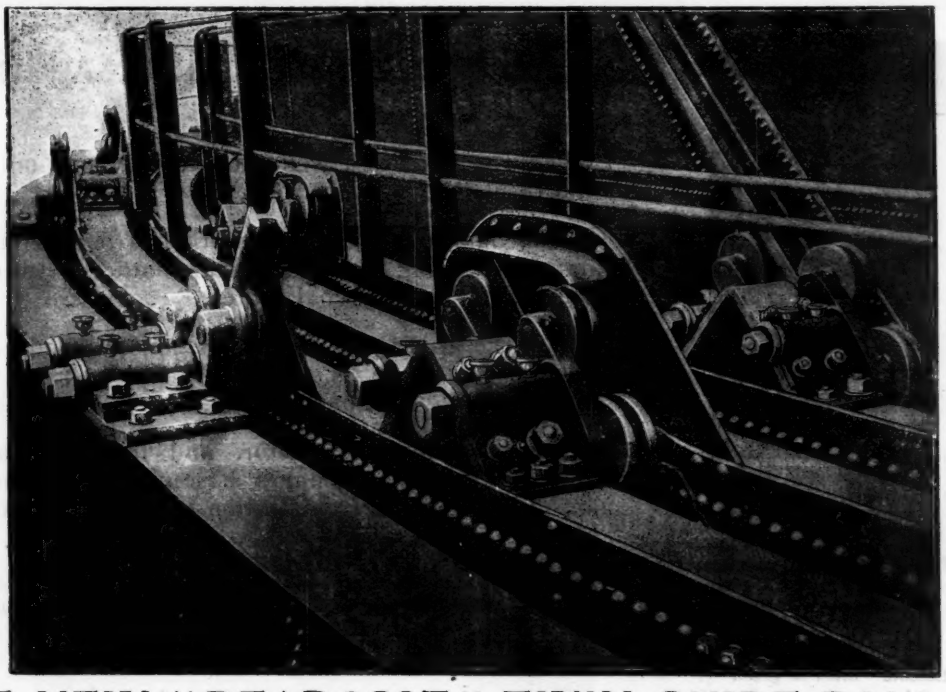
Devonport Gas Prices.—The Plymouth Corporation Gas Committee, whose undertaking supplies the old borough of Devonport, have decided to apply to the Ministry of Health to have the limit of their charges to consumers raised. The present maximum is 4s. per 1000 c.ft., and the rate is 3s. 11d. As soon as the necessary authority arrives, they will put up the price to 4s. 5d. Gas for power purposes will be charged at 4s. 2d., instead of 3s. 8d.; and through the prepayment meters the gas supplied for a penny will be reduced from 17 to 16 c.ft.

Taunton Gas Company.—An increase of 9,371,000 c.ft. of gas sold was reported at the annual meeting of the Company. The amount available for distribution was £3195, out of which maximum dividends of from 5 to 6 p.ct. on the various stocks were declared. The Directors reported that the Bill confirming the Company's Provisional Order would shortly receive the Royal Assent, when the Company would be empowered to raise £120,000 of additional capital. The Chairman (Mr. H. Fisher) said the demand for gas was at present beyond the resources of the Company to meet; but with the new plant now being laid down, they would be able to deal with all likely requirements for some years to come. Mr. R. Bruford called attention to the fact that the ratepayers of Taunton were threatened with the possibility of having to meet a deficit on the municipal electricity undertaking. He protested against this as a dishonest proposal; arguing that the charges should be so fixed as to cover the cost of production, just as a private trading company would have to do.

Coal Production per Miner in Different Countries.

While admitting that the condition of coal beds, thinness and depth of seams, and adaptability to available mining machines and equipment are factors which cannot be overlooked in determining what increase in individual output of coal may be looked for in any given country, Mr. W. W. Adams, the Mine Statistician to the United States Bureau of Mines, has prepared a statement with the object of presenting comparative particulars of individual output under prevailing conditions. Available sources of information for the principal coal-mining countries (covering generally the eighteen-year period beginning with 1901) show that the largest production per man during any year was 1134 short tons, which represents the average production for each underground employee in the coal mines of the United States during 1918. In the same year, the corresponding figure for New South Wales was 814 tons. The smallest individual output for recent years was that of Japan in 1917, where an average of 155 tons was mined by the underground employees, though in 1901 India showed an average of only 122 tons—the smallest figure of any year for the countries under consideration. During the eighteen years, New South Wales and Nova Scotia have averaged 718 and 715 tons respectively. France has shown but little change in the miner's yearly production; averaging 302 tons prior to the war. In Great Britain, the output of coal averaged 400 tons for each underground employee in 1901, and increased to 419 tons in 1906, since when there has been a decline which continued, until in 1918 the figure was only 337 tons—a result which Mr. Adams says is beyond doubt due to the lower daily output per man, rather than to a reduction in the number of working days in the year. Coal-cutting machines are coming into more general use in this country. In 1901 only about 2 p.ct. of the total output was produced with machines; while in 1918 the quantity was over 11 p.ct. With a greater number of working days per year, the individual output in Prussia (ranging from 352 to 459 tons per man) has since 1911 surpassed that in Great Britain. For Austria, the annual output has ranged from 250 to 351 tons per underground worker (the average being 296 tons); and for Belgium about 250 tons during the thirteen pre-war years. Mining operations in the latter country are carried on under great natural disadvantages.

Halifax Gas-Workers and Holidays.—A deputation of Halifax gas-workers, led by their organizing Secretary (Mr. George Kaye), waited upon the Town Council last Wednesday, in respect of an application for double pay for Sunday work and twelve days' annual holiday with pay. The interview, however, was confined to the holiday question, as, at the last moment of the preceding negotiations, the Gas Committee had made an alternative offer in regard to Sunday pay. Mr. Kaye pointed out that all other Halifax Corporation employees had the holiday with pay; and he held that the matter could be dealt with irrespective of any national agreement. The deputation withdrew on securing a promise for the question to be carefully considered.



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MANCHESTER.

Extraction of Benzole from Gas.

One of the series of meetings arranged by the Royal Scottish Automobile Club and the Automobile Association to consider the question of the home production of motor fuel was held in Kilmarnock. It was presided over by Provost James Smith, who urged that all gas companies should extract benzole during the process of manufacturing gas. The Kilmarnock Corporation, he said, had been doing this for the past ten years; but there were other gas undertakings on whom pressure would have to be brought. Captain A. B. Spens, O.B.E. (Scottish Secretary of the Automobile Association) declared that the amount of benzole now produced by gas undertakings could be trebled without any expenditure on additional plant, if all were compelled to extract benzole during the process of gas manufacture. On the proposition of Mr. W. Munro Fraser, a resolution was adopted calling upon the Government, in the national interest, to carry out immediately the recommendations of the Fuel Research Board on Gas Standards, providing that all gas companies should be urged to strip completely the benzole from their gases, and further to remove the restrictions at present hampering the manufacture of commercial alcohol for motor fuel. Replying to an objection by Baillie G. K. Christie that the extraction of all benzole would tend to lower the quality of the gas, Mr. Charles Fairweather (the Gas Manager) said that, under the conditions of the new Act, the gas consumer was only going to pay for the actual heating or lighting power of the gas he was supplied with; so that he would really lose nothing because of the stripping of all the benzole. In any event, the extraction of the benzole only resulted in a depreciation of about 5 p.ct. in the quality of the gas. Mr. W. M. Fraser was appointed the delegate from Kilmarnock district to serve on the Glasgow Committee empowered to carry out the resolution, to confer with corporations and other gas producers further to develop benzole extraction, and to take any other steps to encourage the production of motor fuel.

Nottinghamshire Oil Resources.—Encouraged by success elsewhere, promoters of exploration works at Kelham, near Newark, are entering upon their drilling in strata forming a continuation of that in which oil was found some years ago at a depth 2600 ft. The work is being financed by a Company with a share capital of a quarter-of-a-million; the anticipation being that the borings, which may be carried to 5000 ft., will yield oil of a true paraffin base, containing much that possibly may be refined in the way of bye-products. Anticipations are largely based upon the discovery in this locality in 1911 of oil sands computed to be of a thickness of 15 ft. From the old bore, which was sunk to a depth of 600 ft. in 1911-12, water is now being drawn for steam power for the new borings. Synchronizing with the inauguration of the new experimental oil station at Kirby-in-Ashfield, where the capacity of fuels of widely varying types is to be tested, the new venture is giving an added impetus to the exploitation of Nottinghamshire's oil resources.

Conditions of Work at Burnley.—The Burnley and District Allied Engineering Trades Society have written to the Gas Committee regarding the payment of time-and-a-quarter for work done during the recognized holiday periods. A request was also made for the immediate removal of all dilutees from the work of skilled engineers at the gas-works. The Gas Committee have appointed a Sub-Committee to meet representatives of the Society upon these matters.

Irish Gas Strikes.—The New Ross (Wexford) gas-workers have been on strike for a month, on a claim for higher wages. The cutting-off of the gas supply has, of course, entailed serious inconvenience to industry and business and domestic work generally. At a meeting of the Urban Council, suggestions for settlement were made; and in the meantime the Gas Company intimated that, as a result of the strike, they were unable to quote for the lighting of the public lamps. Clonmel gas-workers are also on strike. Various public activities, including those of the Corporation, have been held up, and several hundred gas-cookers rendered useless.

Trouble Averted at Doncaster.—A strike of gas-workers of the Doncaster Corporation was threatened last week, on a question of holidays, but was averted by a friendly conference between Mr. Morris (the Chairman of the Gas Committee) and the men's representatives, as a result of which it was agreed that the question should be further inquired into. The Committee had decided that, in view of the wages awards recently made, it would not be possible to give holidays with pay; but the men demanded that this ruling should not affect a customary two half-days' holiday in Race Week, which has been given in consideration of two half-days' work on bank holidays. The Town Council subsequently referred back to the Committee the minute dealing with these two half-days.

Co-Partnership at Croydon.—The accounts for the twelve months ended March of the Croydon Gas Company Co-Partnership Committee, show that the bonus has been calculated at the rate of 4 p.ct. Up to March 31 last, from the inception of the scheme, 1219 co-partnership agreements have been entered into, and 493 have terminated, leaving 726 agreements in force. Of these 726 co-partners, eleven are now serving in the forces; but the Directors have decided that bonuses shall continue to be credited to the accounts as if they were still working for the Company. They are also relieved during their period of war service from payment of the subscriptions to which they would be ordinarily liable to the workmen's sick and burial fund and the pension fund, though their membership of these, with the benefits accruing therefrom, is unaffected. The total savings in the 11¼ years the scheme has been in operation amount to £18,313, and the sum invested by co-partners in the Company's stocks to £15,864. The total holdings acquired by co-partners through the scheme are £24,090. The savings amount to 75 p.ct. of the total credited as bonus. There have been purchased for co-partners over 10,000 war savings certificates, through the Association which was formed in connection with the Company in July, 1916.

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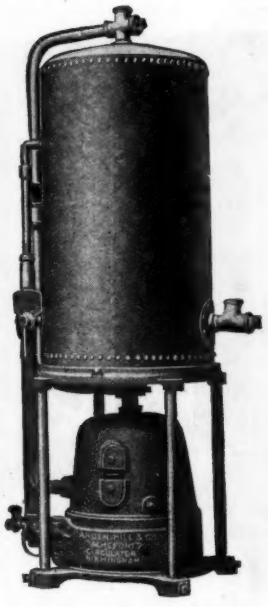
A COMBINED HOT-WATER HEATER, CIRCULATOR, AND STORAGE-TANK.



There could be nothing simpler, more reliable, or more convenient, than this Combined Set. It is very compact, only needs gas and cold-water supply connections, and once the gas is lighted it works automatically, providing hot-water in plenty for all domestic and industrial needs. A patent "Thermostat" prevents needless gas consumption and by the use of an "Economy" Valve large or small quantities of water can be put in circulation at will. Made in four sizes and supplied with high or low stands. Specially treated for use in "hard" and "soft" water districts. Cylinders are made of galvanised iron or copper as desired.

ARDEN HILL & CO.,

"Acme Works" - BIRMINGHAM.

Coke-Stack Fire at Beckton.—Early last week, fire broke out in a 40,000-ton coke-stack at the Beckton works of the Gas Light and Coke Company, and by Saturday it had assumed serious proportions. It was then being tackled by the London County Council brigade, the Gas Company's appliances, privately owned engines, and four steam-grabs. The stack is 1500 ft. long, 150 ft. wide, and 30 ft. high; and the outbreak occurred in the centre.

Neath Gas Strike Ended.—The strike of employees at the Neath Corporation Gas-Works, after having stopped operations for some five weeks, came to an end last Wednesday, when at a mass meeting of the men a large majority voted in favour of accepting the Corporation offer of 4s. increase per week for fitters and 3s. per week for yardmen, leaving the question of the stokers' wages for arbitration. This offer had a fortnight previously been refused by the men. The decision to resume work followed on advice to this effect by Mr. Llewellyn (the men's organizer), who pointed out that everything possible had been done to force their demands, and nothing further could be done in the matter.

Dunfermline Gas-Works Results.—Accounts for the year were submitted at a meeting of the Dunfermline Gas Committee, by Mr. James Campbell, the Engineer and Manager. The expenditure for the twelve months to May 15 was £55,090, an increase of £10,192 on the previous year; while the income amounted to £74,004, an increase of £24,298. There was a gross profit of £18,913, and a net profit of £498, as compared with a deficit of £6707 last year. The total quantity of gas made amounted to 244,556,000 c.ft., an increase of 25,866,000 c.ft., equalling 11·82 p.ct. The average yield of gas per ton of coal was 10,742 c.ft. The income from residuals was £22,229, as compared with £11,041. Some 70 p.ct. of the cost of the coal was recovered from residuals. The manager pointed out that a new gasholder is necessary of not less than 1,000,000 c.ft. capacity. The cost at present might be estimated at £35,000.

Cork Gas Consumers' Company.—Moving the adoption of the report and accounts at the half-yearly meeting of the Company, the Chairman (Mr. W. B. Harrington) said the result of the six months' working had proved considerably better than they had expected. At one time they were afraid that, owing to their heavy expenses, they would not be able to earn even their reduced dividend of 6 p.ct. He was glad to say, however, that their view of the situation did not prove correct. There had been a substantial reduction in freights, which they did not anticipate, and which put matters in a much better position. Though freights had stiffened somewhat of late, they were hopeful that there would be a further reduction in the near future which would help them materially. He need hardly say that, in an industry like theirs, repairs were a very heavy item; and to meet them it was essential for their earning power to be considerably more than the amount represented by the comparatively small dividend of 6 p.ct. During the war they had to postpone practically all big repairs; and therefore they had exceedingly heavy expenditure under this heading before them.

Poisoning Fatality at Oldham.—Three men from Colchester, who arrived in Oldham on Monday of last week to work on highway construction, were subsequently found dead in bed at their lodgings. The windows of the bedroom were fastened, the door shut, and the gas unlighted turned fully on. The men went to bed in good health.

South Barracas (Buenos Ayres) Gas and Coke Company, Ltd.—At the meeting next Monday the Directors will report that, with the debit balance brought forward, there was at Dec. 31 last a total debit of £95,147. During the past year the business was kept going under greater difficulties than ever. Gas had to be made from oil and wood, the average price of the latter showing an increase of 12 p.ct. over the prohibitive rates paid in 1918. As it was impossible to continue financing the losses, on May 1 provisional arrangements were made with the Primitiva Gas Company of Buenos Ayres for a supply of gas, pending a definite contract being entered into for a term of years.

Gas-Fires in Leeds Municipal Houses.—As an experiment, gas fire-place fixtures in place of coal grates are to be provided in twelve of the municipal houses to be erected on the Crossgates Estate, Leeds. An economy in construction will be effected by dispensing with chimney-breasts and flues in the rooms in which gas-fires are authorized. In the houses concerned, this will be in all the rooms except where the kitchen range is placed. The ordinary chimney-stack will be needed to carry off the smoke from the range; but for the gas-fires small flues carried in the ordinary thickness of the wall (on the system already explained in the "JOURNAL") are all that will be provided.

Falmouth Gas Company.—At the annual meeting of the Falmouth Company it was reported that £1886 had been carried to profit and loss account, as against £1135 last year. The increase in the sale of gas amounted to 4,000,000 c.ft. A final dividend of 4½ p.ct—making 7½ p.ct. for the year—was declared. The Secretary (Mr. F. G. Kingwell) stated that the Directors were going to apply to the Board of Trade under the Gas Regulation Act for power to pay a dividend of 10 p.ct. next year. The Chairman (Mr. F. J. Bowles) remarked that the year had been a most anxious one, but with careful management they had come through fairly well. It was resolved that the remuneration of the Directors should be 10 p.ct. on the gross amount distributed among debenture and stock holders.

At an inquest, at Halifax, on the bodies of Mrs. Emily Haigh and her daughter, who had been suffocated during a fire at their home, it was stated that indications pointed to the cause of the fire being a gas-ring, which had apparently been left burning during the night. A verdict of "accidental death" was returned.

The Bradford Corporation and Clayton District Council are nearing the end of prolonged negotiations with a view to the incorporation of Clayton in the city. There are still points of dispute as to certain matters; but the parties have agreed that the price of gas at Clayton would be reduced to the rate charged within the City of Bradford.

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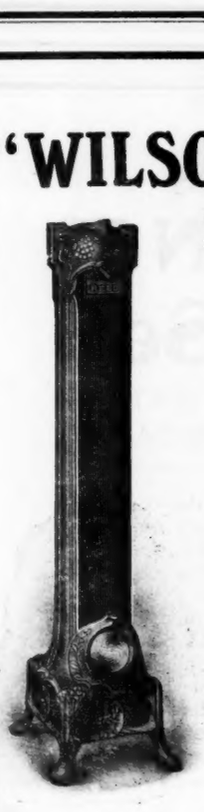
"WILSON" FLUELESS GAS STOVES.

The "Reed" Radiator.



SINGLE.

A really hygienic Gas-Heated Radiator.

NO FLUE required.

Cooled products of combustion escape at floor level.

The air is heated without mixing with the products; therefore is pure.

Each tube heated with plain gas jet.

Size of single tube:

37 ins. high × 9½ ins. wide × 10½ ins. deep.

A single tube should heat a space about 10 ft. × 10 ft.

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STOCK MARKET REPORT.

THE course of things on the Stock Exchange last week showed little change from that which characterized its predecessor, though perhaps it was even a shade more quiescent. In one respect the oppression that kept things down was relieved by the great success of the Polish arms, and the consequently moderate tone and demeanour of the Russian Reds. Apprehension in regard to the threatened strikes was, of course, alive. But even this seemed to be susceptible of calmer views at times; and if markets in general were dull, at all events there was no market pressure to sell.

The gilt-edged group was dull on the whole; but a fairly steady line might be found here and there. Home Government issues were rather variable, but closed without having lost much. On Friday, the figures for the big four were: Consols 45½-46, War Loan 84 8/16-84 12/16, Funding 66⅝-67¼, Victory 74⅛-75⅛. Bonds were firm, and some corporation issues met with support. Indians were down.

Home Rails were not wanted and closed easy. Canadians did fairly well; but Argentines were quiet.

The Foreign market had little attraction; but Belgian and Japanese were firm, and French fairly steady. The Miscellaneous department was not remarkable for strength.

Business in the Gas Market was almost in a state of lethargy, except for one or two special lines. No more than eight undertakings in all were dealt with; but the general steadiness was not impaired by inaction. In the London companies, Gas Light and Commercial were steady, and South Metropolitan advanced 3. The Suburban and Provincial group was almost untouched. Imperial Continental was the most active of all and touched 127⅞; the quotation showing a rise of 5. Primitivas were weaker; the 1911 debenture issue and those of Buenos Aires and River Plate each receding from 2 to 3 points.

Bargains done for cash during the week were as follows: On Monday, British 22¾, 22 7/16, Gas Light ordinary 50⅛, 51, Imperial Continental 122, 124⅛, 125, Primitiva 12s., ditto preference 30s., River Plate debenture 44⅜, 45, South Metropolitan 56. On Tuesday, Commercial 4 p.ct. 50½, Gas Light ordinary 50⅛, 51, 51¼, 51½, Imperial Continental 125, 125⅜, 126, ditto debenture 82, Oriental 100, South Metropolitan 57. On Wednesday, Buenos Aires debenture 43, Gas Light ordinary 51½, ditto preference 56¼, Imperial Continental 125, 125⅛, 126, Primitiva preference 28s. 1½d., River Plate debenture 42, 42½, 43. On Thursday, Gas Light ordinary 50¾, 51, 52, Imperial Continental 126, 126⅛, Primitiva preference 29s. On Friday, Commercial 3½ p.ct. 44½, Gas Light preference 56¼, Imperial Continental 126, 126⅛, 126¾, 127, 127½, 127⅞, Primitiva 11s, ditto preference 25s., 25s. 6d., South Metropolitan 56½, 57, 59⅜, 60, South Suburban 60, Exeter 7 p.ct. new 8.

In the Money Market, the tightness which had ruled for a week or two back more or less was continued, and held on very pertinaciously to the close. Government demands had a share in bringing this about, with the repayment of the first-drawn Victory Bonds among other items. Discount terms at one time promised some relaxation, but closed very firm. Silver fell, and afterwards recovered. The Bank rate is 7 p.ct., as fixed on April 17.

While greasing a coke-extracting machine at the Thornton Road Gas-Works, Bradford, Sydney Cawthran had his right hand torn off, as the result of its being caught in the cog wheels.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 27	4	4%	Aldershot 4 p.c. Pref.	...	56—61*	...
1,551,868	,,	Mar. 26	2½	3 1/16%	Alliance & Dublin Ord.	59—64	42—47	...
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	55—60	...
280,000	5	May 13	7½	8%	Bombay, Ltd.	5⅜—6⅜	4¼—5¼	...
50,000	10	Aug. 12	16	5%	Bournemouth Gas and Water: 10 p.c.	29—30	8½—8¾	...
383,110	10	,,	7	7%	Bournemouth Gas and Water: B 7 p.c.	15—15½	8¼—9¼	...
115,000	10	,,	6	6/-	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	7¾—8¼	...
162,065	—	June 25	—	4%	Bournemouth Gas and Water: 4 p.c. Deb.	...	62—64	...
992,045	Stk.	July 14	14	30/-	Brentford A Consolid.	261—266	45—50	...
734,920	,,	,,	11	26/3	Do. B New	204—209	43—48	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—73	...
221,400	,,	June 10	4	4%	Do. 4 p.c. Deb.	91—93	63—65	...
214,775	,,	Aug. 27	11	7½%	Brighton & Hove Orig.	208—213	120—125*	...
244,200	,,	,,	8	5⅜%	Do. A Ord. Stk.	154—159	78—83*	...
1,287,500	Stk.	July 29	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	April 14	12½	10%	British	44—45	22—24	22½—22 7/16
120,000	Stk.	June 25	4	4%	Do. 4 p.c. Deb. Stk.	88—90	57—59	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	42—45	43
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1¼—2½	7—7½	...
100,000	10	,,	—	4½%	Do. 4½ p.c. Pref.	4—6	5½—6½	...
100,000	Stk.	June 25	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	56—61	...
137,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	Aug. 12	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	50—55	50½
560,000	,,	,,	5½	26/3	Do. 3½ p.c. do.	103—105	44—49	44½
475,000	,,	June 10	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	45—47	...
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	27—32	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	40—60	...
51,600	,,	Aug. 27	14½	10½%	Croydon A 10 p.c.	...	125—133*	...
278,400	—	,,	11½	7½%	Croydon B and C 7 p.c.	...	85—95*	...
492,270	Stk.	—	6	5%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	6½—7½	...
16,298,975	Stk.	July 29	4/17/4	30/-	Gas Light and Coke: 4 p.c. Ord.	98—102	50—53	50½—52
2,600,000	,,	,,	3½	26/3	Gas Light and Coke: 3½ p.c. max.	76—79	39—42	...
4,062,235	,,	,,	4	4%	Gas Light and Coke: 4 p.c. Con. Pref.	96—99	55—58	56½—56¾
4,674,850	,,	June 25	3	3%	Gas Light and Coke: 3 p.c. Con. Deb.	72½—74½	45—48	...
130,000	,,	Dec. 11	10	10%	Gas Light and Coke: 10 p.c. Bonds.	...	...	...
82,500	,,	Mar. 11	5	3½%	Hastings & St. L. 5 p.c.	...	55—60	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	38—43	...
70,000	10	May 13	11	8½%	Hongkong & China, Ltd.	16½—16¾	8½—9½	...
86,600	Stk.	Mar. 11	9	5½%	Hornsey 7 p.c.	...	88—93	...
131,000	,,	Aug. 12	7½	4½%	Ilford A and C	151—154	84—89	...
65,780	,,	,,	6½	3½%	Do. B	115—118	64—69	...
65,500	,,	June 25	4	4%	Do. 4 p.c. Deb.	92—94	55—58	...
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	125—130	122—127½
1,235,000	,,	Aug. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	80—85	82
235,242	,,	Mar. 26	6½	5%	Lea Bridge Ord. 5 p.c.	119—121	80—85	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. A.	211—213	...	...
					Liverpool 5 p.c. Ord. B.	146—148		...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Aug. 12	7/5/6	3½%	Maidstone 5 p.c.	...	52—57	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4¼—4½	1¾—2¼	...
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	89—96	...
541,920	Stk.	May 27	4	6%	Monte Video, Ltd.	11½—12	70—75	...
1,875,892	,,	July 29	4½	3½%	Newcastle & Gatsh'dCon.	98½—99½	60—61	...
529,705	,,	June 25	3½	3½%	Do. 3½ p.c. Deb.	82—83	50—51	...
15,000	10	Mar. 11	—	8%	North Middlesex 10 p.c.	...	13—13½	...
55,940	10	,,	7/14/0	5 3/16%	,, ,, 7 p.c.	14—15	7¼—8¼	...
300,000	Stk.	May 13	8	8%	Oriental, Ltd.	117—122	99—102	100
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	2—3	...
60,000	50	Aug. 27	13	7½%	Portsea Island, B	128—131	65—70*	...
100,000	50	,,	12	6¾%	Do. C	118—121	50—55*	...
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	½—1	11/—12/-
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½—5	1½—1¾	25/—30/-
321,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	69—71	...
600,000	Stk.	July 29	4	4%	Do. ,, ,, 1911	...	43—46	...
346,198	,,	June 25	4	4%	River Plate 4 p.c. Deb.	85—87	42—45	42—45
150,000	10	Mar. 26	6	6/-	San Paulo: 6 p.c. Pref.	10½—11	6¼—7¼	...
125,000	50	July 2	5	5%	San Paulo: 5 p.c. Deb.	47—49	38—40	...
135,000	Stk.	Mar. 11	10	5%	Sheffield A	223—224	68—73	...
209,984	,,	,,	10	4%	Do. B	222—224	58—63	...
523,500	,,	,,	10	3½%	Do. C	220—222	53—55	...
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	June 25	9	9%	South African	10½—11½	11—12	...
6,609,895	Stk.	Aug. 12	5/4/0	30/-	South Met. 4 p.c. Ord.	111—113	55—60	56—60
250,000	,,	July 14	—	5%	Do. Pref.	...	91—93	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	45—47	...
224,820	,,	Aug. 27	8½	3%	South Shields Con. Stk.	157—159	95—96*	...
1,087,795	,,	July 29	6	3½%	S'th Suburb'n Ord. 5 p.c.	114—116	60—65	60
247,558	,,	June 25	5	5%	Do. 5 p.c. Deb. Stk.	116—118	70—75	...
647,740	,,	May 13	7½	3½%	Southampton Ord.	99—102	57—60	...
121,275	,,	June 25	4	4%	Do. 4 p.c. Deb. Stk.	...	59—61	...
120,000	,,	Aug. 12	—	3½%	Tottenham: A 5 p.c.	135—138	59—64	...
782,275	,,	,,	6	2½%	Tottenham: B 3½ p.c.	115—117	51—56	...
181,255	,,	June 10	4	4%	District: 4 p.c. Deb.	87—89	60—63	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Mar. 11	5	3½%	Tynemouth 5 p.c. max.	108½—109	71—73	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Aug. 27	8½	47/6	Wandsworth A 5 p.c.	151—156	75—80*	...
255,636	,,	,,	6½	32/6	Do. B 3½ p.c.	129—134	50—55*	...
108,075	,,	,,	—	33/3	Do. C	...	50—55*	...
140,865	,,	,,	—	33/3	New Ordinary	...	50—55*	...
352,000	,,	,,	6½	26/3	Wimbledon 5 p.c.	117—122	43—48*	...
98,000	,,	,,	6½	32/6	Epsom 5 p.c.	121—126	50—55	...
88,416	,,	June 25	3	3%	3 p.c. Deb. Stk.	66—69	44—47	...

*Ex Div.

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